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THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW
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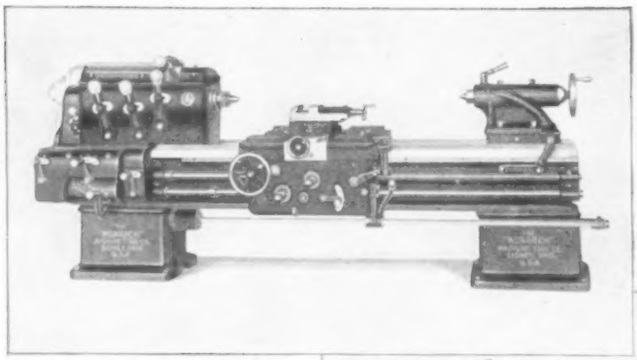

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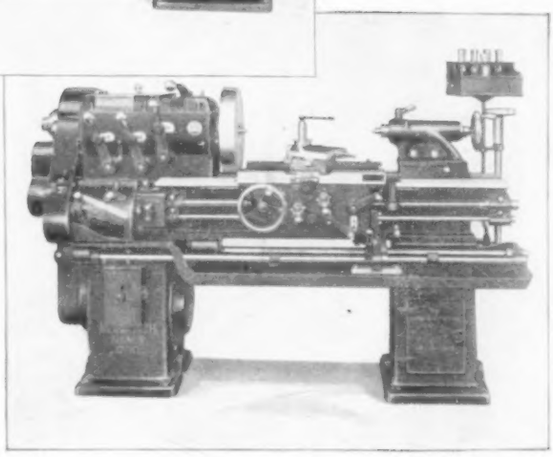

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Vol. 25 NEW YORK, OCTOBER, 1927 No. 10

Electro-Plating Safety Razors

The New Installation of the Gillette Safety Razor Company in Boston, Mass. This Paper, Published for the First Time in The Metal Industry, Was Read at the Recent Convention of the American Electro-Platers' Society in Toledo, Ohio

By FLOYD T. TAYLOR

Vice-President, Hanson-Van Winkle-Munning Company, Matawan, N. J.

The object of this paper is to point out the solution of a problem of quality electroplating, combined with a large scale commercial production.

The electroplating plant of the Gillette Safety Razor Company in Boston has been selected as the example to be described, because, while their product is unique, the precision required to pass their inspectors means that successful equipment furnished to them illustrates production electroplating at its best. Furthermore, practically any kind of plating, of any sized article and any volume of continuous production can be handled by using the same general layout as installed by the Gillette Company.

In order to explain the problem, now solved by the new plating room, presently to be described in detail, let us spend just a moment to outline the character of the products of the Gillette Safety Razor Company and their production growth up to the present time. Also take note that expected growth is provided for in the new plant layout.

QUALITY PARAMOUNT

From the outset of its business career, quality has been the watchword of the Gillette Company and nothing whatsoever has ever been allowed to interfere with this watchword of quality above all. New methods are checked first and foremost to ensure a maintenance of quality and unless it is first established and later demonstrated that the proposed changes will still maintain, or improve, the quality of the finished article, no further attention is paid to any proposed change of method.

The products made are the holder, consisting of five separate pieces, assembled after plating to three parts, called the guard, the cap and handle, all made of a special brass and all polished and electroplated with gold, silver or nickel as desired for final finish. The making of the steel blades is an industry in itself. Other articles manufactured are such as metal razor boxes, blade boxes, soap boxes, surgical knife handles, chiropodists' chisel handles, carpet pile wires, textile edges, string cutters, and the office knife.

MAKING BLADES

As the making of blades represents one form of metal finishing, the general process of making the blades will be described briefly. The steel in a continuous ribbon is fed into automatic presses which punch out the blanks in two rows and deliver these blanks to a canvas conveyor belt to carry them to a washing machine. The blades are then assembled in frames and put through the tempering process, after which they are tumbled for twenty-four hours to remove the heat scale and to burnish.

From the tumbling barrels they pass through several different types of automatic sharpening machines which form and finish the cutting edges. Rigid inspections are maintained at each step of this process, but the final inspection is of course the most interesting and the most exacting.

The organization of the Final Blade Inspection Department is unique. The department of about three hundred girls is under the supervision of the chief blade inspector who is assisted by a foreman and forewoman. There are eighteen section supervisors each of whom have direct charge of a section of sixteen girls. Each section is made up of ten inspectors who carefully inspect every blade, five reinspectors who check the work done by the first ten inspectors and one floating inspector who substitutes for absentees or does other work as may be necessary.

The employment manager uses the utmost care in selecting employees for this department and each applicant must pass an extremely rigid eye examination before being accepted for the inspection training course which covers a period of seven weeks.

The blades are inspected and reinspected and every blade which shows the slightest defect of any kind is rejected. Only one grade of blade is sent along from this department to the packers and that is the perfect shaving blade. Every possible precaution is taken to maintain the high standard of quality on which the Gillette Company's reputation is built.

From this final inspection the blades go to automatic machines which wrap them in waxed paper shield, sealed

with water free vaseline. The daily production of blades at Boston at present is two million two hundred thousand blades in eight and two-thirds hours, and these blades are sent all over the world, where they comfortably make men more like humans and less like animals. So much for the blade making.

GROWTH OF THE GILLETTE COMPANY

In order to give a clearer picture of the polishing and plating as done at present it seems well to trace the development of metal finishing by the Gillette Company since the rapid growth of production requirements has, of course, been the cause of the various expansions of the polishing and plating departments.

In 1902 the Gillette Company rented a loft and installed these two activities in it. Exact records of the equipment

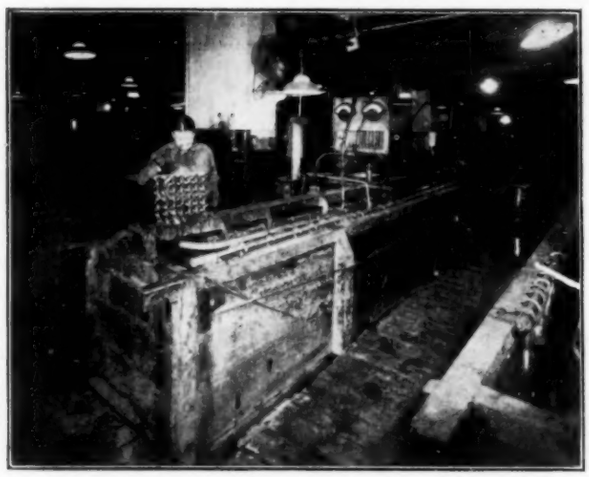


FIG. 1—SERVICE-AUTOMATIC PLATING TANKS

used are not available, but it is still remembered that the department had a large surplus capacity. Yet the following year a plant of still larger size was needed and this plant when finished was considered a model which others might do well to copy. The total power was supplied by a 5 H.P. motor, which served buffs, scratch brushes and the plating dynamo. Two small silver plating tanks, a crock for gold and the expected auxiliary dips and rinses completed the equipment. All the plated parts were hand burnished after plating with the familiar blood stone burnishers. Skill and eternal vigilance were the only controls used and yet it is doubtful if any article has ever been produced with a more satisfactory electroplate. It is this standard of quality that is now being maintained, just as rigidly as ever, but on a volume production inconceivable, with strictly manual handling.

With automatic handling, modern, electrical and chemical controls are used, nevertheless, it must be remembered that those who plan to eliminate human skill entirely from a job of fine electroplating are probably planning a failure and facing a disaster.

The plating department was increased in 1907 to eight tanks, producing one thousand razors per day with a crew of four men to handle the work.

In 1909 the plating room was enlarged again and bright silver solutions installed to eliminate some of the hand burnishing.

In 1915 the first attempts at automatic control were made through the installation of Sangamo Meters.

In 1917 with a normal production of four thousand razors per day, the Government placed orders for supplies for the Army and Navy that required a production of thirty-five thousand complete razors per day—or more than one hundred seventy-five thousand separate pieces to be plated. To care for this production twenty-four nickel tanks of one hundred and fifty gallons each were installed and the pay roll of the plating department showed the employment of sixty-five men and seventy-five girls.

After the war, instead of a reduced production, the demand grew steadily and the following changes were made in an attempt to keep up with the production requirements.

First: The use of racks designed by Gillette engineers to hold one hundred parts for plating and supplanting the old wiring system which accommodated but five pieces to a wire. This saved a tremendous amount of time and labor.

Second: Adopting semi-automatic plating tanks of the screw conveyor type for nickel and silver plating.

Third: Installation of automatic plating barrels for the smaller razor parts.

Fourth: Eliminating hand scrubbing and cleaning work by adopting automatic cleaning processes.

None of these improvements were adequate nor did the mere expansion of tank capacity in the shape of semi-automatic conveyors cope with the problems of uniformity, continuity of production, space or labor.

Consequently, faced with a daily production of seventy-five thousand complete razors, and a corresponding number of metal cases and miscellaneous parts in nine hours, and to take care of peak demands, the further specification of one hundred and fifty thousand complete razors and accessories to be finished by operating twenty hours per day, the Gillette engineers set to work, with their accustomed thoroughness, to analyze their problem, and to consider, not only available apparatus, but also, what changes or improvements in existing designs were necessary to solve their problem. More than nine months were devoted to an intensive study of the problem from every known angle and every questionable suggestion was carefully checked. For the sake of the emphasis it deserves, let it be restated that maintainance of quality ranked first and inviolate throughout all this planning.

PRODUCING 150,000 COMPLETE RAZORS PER DAY

Now the layout selected to solve their problem is this:—First: That a group of plating barrels, with the cleaning

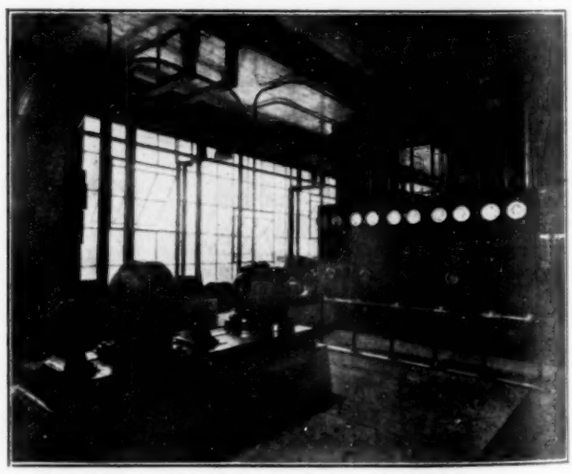


FIG. 2—GENERATOR SET-UP

and rinsing tanks needed for barrel plating be installed and that this group be served by a simple monorail hoist and crane.

Second: That all parts requiring either wiring or racking be cleaned, rinsed, bright dipped, rinsed, plated, rinsed and dried on full automatic continuous chain conveyors.

The plant as installed will now be described as far as its principal details are concerned and this description will be illustrated by lantern slides showing first the superseded plating room and then the new plant.

The polishing of the various pieces composing the razor handle is done on automatic machines developed by the Gillette engineers themselves. For cutting down tripoli is used, for final coloring rouge is used for gold and silver and lime for nickel. Burnishing, when required is done by rolling on polished steel plates. The polishing is all done in a separate department entirely distinct from the plating.

The plating room occupies the top floor of the new nine-story concrete addition to the Gillette plant. Endless belt and ladder type chain conveyors deliver the work to the plating room from the floors below.

ELECTRICAL EQUIPMENT

Starting, of course, with the generation and distribution of the electrical energy, the following facts will be of interest. The motor generators consist of Munning Optimus Generators driven by General Electric induction motors. These sets are installed in a seperate glass enclosed room, ventilated from the outside. The switchboard containing the starting compensators, meters, and generator field regulating rheostats, is also mounted in this room. Flat copper bus bars in strips mounted on edge, and separated for ventilation, carry the current to the electrified tanks. The copper section is distributed on the basis of five hundred amperes per square inch.

The complete list of motor generator sets and their application is as follows:

Amperes	Rated Voltage	For
1,000	12	Direct Electric Cleaner
2,000	6	Reverse Electric Cleaner & Plating Barrel
2,000	4½	Nickel Conveyor
1,500	3	Silver Conveyor
300	6	Gold Conveyor

Automatic voltage regulating relays control the separately excited shunt type generators that supply current to the gold, silver and nickel conveyor plating tanks, and therefore the drop from anode to cathode in these tanks remains constant at any desired value regardless of the load in the tank. These regulators prevent burning of the work and they make it possible to secure a uniform current density. Separate tank regulating rheostats of the parallel coil type, each furnished with a volt meter and ammeter, are installed on all other plating tanks.

EQUIPMENT AND TIME CYCLES

Before describing the plating room equipment itself, let it be noted that the time cycles determined by actual test will be given, because they are both interesting and correct for the work they do. However, these time cycles are flexible so that the required deposit can be applied to the several quality classes.

Furthermore, for various reasons, the principal of which is the elimination of argument on the details of solution, composition and control, it is outside the scope of this paper to give formulas, current densities and the like. Let us confine ourselves to the mechanical details and general dimensions.

Considering now the conveyors, in general they consist of a continuous overhead chain conveyor supported from the ceiling and mechanically independent of the tanks they serve. All three are arranged for end loading and unloading so that one attendant loads and unloads each machine.

Effective exhaust hoods carry away fumes without impairing the accessibility of the complete machine.

All the tanks are ¼" steel of the rivet and double weld type. The tanks carrying acid solutions are lined with fifteen pound chemical lead. The tank for the gold solution is glass lined and jacketed for hot water heating.

For gold the standard time cycle is as follows:—

1—Load .....
2—Hot Soak.....11 1/16 min.
3—Hot Rinse & Spray..38 sec.
4—Electric Cleaner.....5 min.
5—Reverse Electric Cleaner .....38 sec.
6—Cold Rinse & Spray..38 sec.
7—Cyanide Dip.....38 sec.
8—Cold Rinse & Spray .....12⅓ min.
9—Cold Rinse & Spray..38 sec.
10—Gold Plate.....4½ min.
11—Cold Rinse (Reclaim) .....1 min.
12—Cold Rinse & Spray.38 sec.
13—Hot Rinse & Spray..38 sec.
14—Dry—Hot Air .....5 min.
15—Unload .....

The principal dimensions of the conveyor are:—

Center to center of work hangers.....16 in.
Normal chain speed per minute.....11 in.
Height of lift.....28 in.
Total length of tanks on floor.....40 ft. 5 in. (Approximately)
Total width of tanks, approx.....6 ft. 6 in.
Headroom required .....10 ft.

The silver conveyor is novel in that a single overhead chain conveyor serves two parallel sets of tanks so that both bright and dull silver plating can be done on a single machine depending merely on whether the racks are hung on the inside or outside end of the work hanger cross arm. The standard time cycle for bright silver is:—

1—Rack .....
2—Hot Soak.....9⅓ min.
3—Hot Rinse & Spray.28 sec.
4—Electric Cleaner.3 1/5 min.
5—Reverse Electric Cleaner .....24 sec.
6—Cold Rinse & Spray.24 sec.
7—Cyanide Dip.....24 sec.
8—Mercury Dip.....24 sec.
9—Cold Rinse & Spray.44 sec.
10—Silver Strike No. 1.24 sec.
11—Silver Strike No. 2 .....1⅓ min.
12—Cold Rinse & Spray .....3⅓ min.
13—Silver Plate.....30 min.
14—Cold Rinse & Spray.24 sec. (Reclaim)
15—Cold Rinse & Spray.44 sec.
16—Hot Rinse & Spray.24 sec.
17—Unload .....

The standard cycle of the dull silver is:—

1—Rack .....
2—Hot Soak.....9⅓ min.
3—Hot Rinse & Spray.28 sec.
4—Electric Cleaner.3 1/5 min.
5—Reverse Electric Cleaner .....24 sec.
6—Cold Rinse & Spray.24 sec.
7—Cyanide Dip.....24 sec.
8—Cold Water .....24 sec.
9—Cold Rinse & Spray.44 sec.
10—Silver Strike No. 1.24 sec.
11—Silver Strike No. 2 .....1⅓ min.
12—Cold Rinse & Spray .....3⅓ min.
13—Silver Plate .....30 min.
14—Cold Rinse & Spray.24 sec. (Reclaim)
15—Cold Rinse & Spray.44 sec.
16—Hot Rinse & Spray.24 sec.
17—Unload .....

The principal dimensions of this conveyor are:

Center to center of work hangers.....16 in.
Normal chain speed per minute.....15 in.
Height of Lift.....28 in.
Total length of tanks on floor.....51 ft. 1 in. (Approximately)
Total width of tanks, approx.....6 ft. 6 in.
Headroom required .....10 ft.

The nickel conveyor is based on the following time cycle:—

1—Rack .....
2—Hot soak.....10 min.
3—Hot Rinse & Spray.36 sec.
4—Electric Cleaner ...3.5 min.
5—Reverse Electric Cleaner .....36 sec.
6—Cold Rinse & Spray.21 sec.
7—Cyanide dip.....21 sec.
8—Cold Rinse & Spray.21 sec.
9—Cold Rinse & Spray.3 min.
10—Nickel Plate..... 15 min.
11—Cold Rinse & Spray.21 sec.
12—Hot Soap Dip.....21 sec.
13—Hot Rinse & Spray.21 sec.
14—Dry—Hot Air....3⅓ min.
15—Unload .....

And its principal dimensions are:

Center to center of work hangers	16 in.
Normal chain speed per minute	20 in.
Height of Lift	28 in.
Total length of tanks on floor (approximately)	53 ft. 1 in.
Total width of tanks, approx.	6 ft. 9 in.
Headroom required	10 ft.

The holding capacities of the standard racks used on these conveyors is as follows:

Caps and Guards	150	Soap Barrels	30
Tubes	70	Soap Covers	50
Cases	10	Soap, Inner Caps	100

So much for a description of the conveyors.

FIG. 3. BATTERY OF PLATING BARRELS

The plating barrel equipment is divided into two sections so that the large size machines for silver and nickel dryer are separated from a similar group of jewelers type plating barrels and auxiliary equipment for the parts plated with gold in plating barrels.

Six single cylinder Munning Optimus Type E 20 machines are required for silver plating, two single cylinder Munning Optimus Type E 20 machines do the nickel plating and two Munning Optimus jewelers plating machines take care of the gold plating.

SPECIAL FEATURES

Just a word on anodes. For gold anodes assaying 24 carats are used. For silver the anodes are 999 fine, and for nickel 99.9 per cent electrolytic nickel is used.

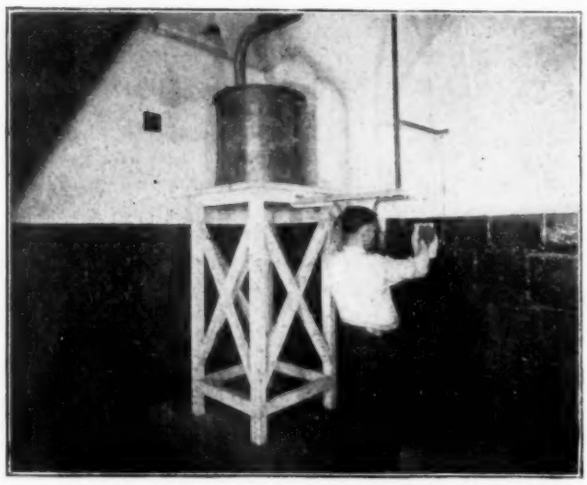


FIG. 4. NEW METHOD OF HANDLING ACIDS

Lacquering of gold and silver razors is done on a ladder chain dip lacquering machine located three floors below the plating room.

A special feature of the Gillette layout worthy of note is that of acid handling.

The sulphuric acid used in the plating room is stored in a tank located in the street from which it is pumped by an air lift pump to the plating room on the ninth floor into a reserve tank from which it is drawn whenever it is needed.

FIG. 5. PLATING RACKS

As this new plating room is just being put into operation, it is too early to give performance figures. It is already evident, however, that the expectations of those responsible for the design, installation and operation of

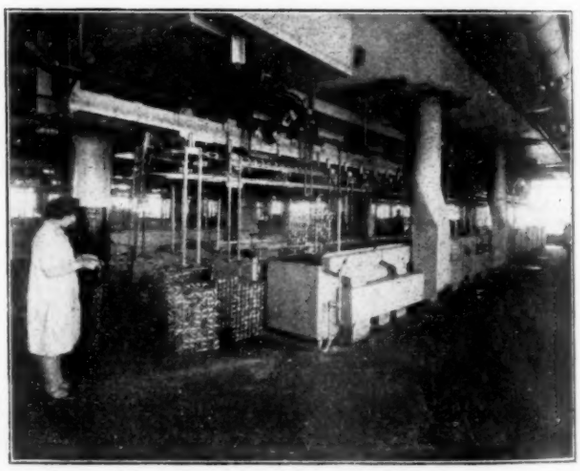


FIG. 6. FULL AUTOMATIC CONVEYOR

the apparatus are to be achieved, and that the problem of the Gillette Company has been solved correctly.

Pocket Knives

A questionnaire has been drawn up by the Simplified Practice Committee of the Pocket Knife Industry, and will be circulated to all manufacturers in the near future, with the request that the information required be returned to the Division of Simplified Practice of the Department of Commerce, Washington, D. C., where it will be tabulated and serve as the basis for a simplified practice recommendation.

National Metal Week

A Report of the Meeting of the Institute of Metals Division With Three Other Technical Societies in Detroit, Mich., September 19-23, 1927

Written for The Metal Industry by H. M. ST. JOHN, Chief Metallurgist, Detroit Lubricator Company, Detroit, Mich.

The gathering of metal men in Detroit during the week of Sept. 19th was so large, and so notable in other aspects, as to earn the name "National Metal Week." Three hundred exhibitors of steel products, heat-treating furnaces, machine tools, testing devices and supplies occupied 93,000 sq. ft. in Convention Hall and attracted 12,000 to 15,000 visitors each day for five days. Technical sessions were held by the American Society for Steel Treating, the American Welding Society, the Institute of Metals Division of the A. I. M. E. and the Production Division of the Society of Automotive Engineers. It was estimated that Detroit was host to twenty thousand out-of-town visitors in connection with these various events.

Three sessions were held by the Institute of Metals Division, nearly all of the papers dealing primarily with wrought rather than cast metals.

METALLOGRAPHY AND X-RAY ANALYSIS

The Tuesday morning meeting, presided over by Dr. Zay Jeffries, resolved itself very largely into a discussion of the x-ray analysis of metals. This refers, not to the examination of metal articles for the purpose of detecting blow holes and other defects, but to the diffraction prints or spectrograms obtained when metallic specimens are tested in specially designed x-ray equipment. This method of testing throws new light on those properties of crystal arrangement and physical condition which govern plastic deformation, and is consequently of considerable interest to fabricators and manufacturers of wrought metal.

Two papers of the above type, "The X-Ray Analysis of Plastic Deformation of Zinc," by T. A. Wilson and S. L. Hoyt, and "The Condition of Thorium in Thoriated Tungsten Filament," by Ancel St. John, excited an animated discussion, during which disagreement among the doctors was very clearly marked. Two papers along somewhat similar lines dealt with "Twinning in Ferrite," by L. W. McKeehan, and "The Production of Metallic Single Crystals," by J. A. M. Van Liempt.

Dr. Jeffries closed the discussion by stating his belief that we are gradually closing in on certain baffling problems which less advanced scientific methods have been unable to solve. He pointed out that the present status of x-ray technique is somewhat similar to that of metallography in its early days, where no two investigators were able to agree in their interpretation of what the microscope had to show. In time the practical metallurgist may use the x-ray as freely and with as much confidence as he now uses the microscope.

Recent developments in a somewhat related field were described in a paper entitled "Quantitative Spectrum Analysis," by F. Twyman and D. M. Smith. In the modern spectroscope, particularly the quartz spectrograph, the plant metallurgist finds a new and fascinating tool of unquestioned value. By its means, metallic impurities, present in minute quantities, may be quickly identified and quantitatively determined with surprising exactness. The segregation of impurities in a metallic specimen may also be studied with a precision which even the metallographic microscope can hardly equal. In the absence of the authors the paper was read by title only and there was no discussion.

METAL WORKING AND ROLLING

A joint session of the Institute of Metals Division with the American Society for Steel Treating was held Wednesday afternoon, W. R. Webster presiding. The papers given at this session were authoritative and were informative rather than controversial in nature. As a result there was very little discussion. "Wrought Zinc" was the subject of a paper by C. S. Trewin, in which quite complete instructions were given for the forming and machining of pure zinc. A paper by W. H. Bassett and C. H. Davis, "Physical Characteristics of Commercial Copper-Zinc Alloys," described the characteristics of sheet brass as affected by varying degrees of work and heat treatment. Specification data and testing methods were outlined. In discussion it was brought out that quenching of a pure brass alloy does not change its properties as compared with slow cooling in air. "Machining Aluminum," by R. L. Templin, described correct tooling, lubrication and cutting speeds for aluminum and its alloys.

"Nickel and Monel Metal with Especial Reference to Annealing" by C. A. Crawford was an able exposition of a difficult subject. Ignorance of the facts given in this paper has many times been responsible for failure to utilize the valuable properties of nickel and its alloys. The author demonstrates that in order to get satisfactory results from cold-forming operations with these metals the cold work in each of a series of operations should amount to a reduction of not less than 20% nor more than 30%, and that the anneal between operations should be such as to cause a complete refinement of grain with miminum grain growth. A large-grained piece will be soft without possessing ductility.

ALUMINUM AND ALUMINUM ALLOYS

The Thursday morning session dealt exclusively with aluminum and its alloys. Papers on "Heat Treatment of Aluminum-Silicon Alloys," by R. S. Archer, L. W. Kempf and D. B. Hobbs, and "Equilibrium Relations in Aluminum-Silicon and Aluminum-Iron-Silicon Alloys of High Purity," by E. H. Dix, Jr. and A. C. Heath, Jr., were so complete that they provoked but little discussion.

In the discussion of C. F. Nagel's paper on "Some Aspects of the Commercial Manipulation of Aluminum," the spot welding of thin aluminum sheet was the principal point of interest. This depends upon the composition of the material, since the higher the electrical resistivity the heavier the sections which may be successfully welded. Sheets of pure aluminum 0.064" thick have been satisfactorily welded, as have alloy sheets up to a thickness of 0.1875."

TESTING METALS

The Friday afternoon session of the American Society for Steel Treating was of interest to all who have occasion to make laboratory tests on metallurgical specimens. Unfortunately the paper on "Relationships between Rockwell, Brinell and Scleroscope Numbers," by R. R. Moore, was not presented because the author was not present and the paper had not been preprinted. A paper entitled "Rate of Loading and Time of Application in Brinell Testing," presented by H. M. German, was in the nature of a report by the A. S. S. T. sub-committee on hardness testing. The conclusion of the committee was that in ordinary

commercial testing, the load should be brought up to its maximum in not less than eight seconds and maintained for not less than thirty seconds thereafter. In research work, where exceedingly accurate results are desired and fine distinctions are to be made, considerably longer periods, up to as much as ten minutes, may be employed to advantage. It was pointed out that uniformity of testing practice is very important whenever the Brinell test is to be used in connection with purchase by specification.

Professor Orlan W. Boston gave a paper on "Machinability of Metals," outlining the various methods which can be used to measure this important factor, of interest alike to ferrous and non-ferrous industries. This paper aroused a good deal of discussion, most of it dealing more particularly with the ferrous metals. It was quite generally agreed that the properties which determine machinability cannot reliably be measured by any hardness test, although with any certain material the Brinell hardness, for example, is frequently a guide to its machinability as compared with other materials of closely similar composition. It was agreed that this is a field in which much important work remains to be done.

Manufacturers of large castings were interested in Ancel St. John's paper on "High-Speed, High-Voltage X-Ray Diffraction Analysis of Metals," describing improved equipment and methods for detecting concealed defects in castings of heavy section. A paper by H. F. Beecher, discussing "The Important Properties and Requirements of Some Special Refractories," was also of interest since refractories play a necessary part in nearly all metallurgical processes.

INSTITUTE OF METALS DINNER

The Institute of Metals dinner on Wednesday evening was well attended and thoroughly enjoyed. Chairman Merica called on various committee chairmen for informal reports. Secretary Corse of the Institute of Metals Division and Secretary Bain of the A. I. M. E. also gave short talks covering plans for future meetings. The speaker of the evening was Mr. E. Blough, Technical Director of the Aluminum Company of America. Mr. Blough discussed the serious technical problems encountered in bringing the production of metallic aluminum from its ore to its present high standard and enormous volume. He mentioned that a new electrothermic process has been developed to replace in part at least, the present complicated chemical process for purification of the crude ore. No technical details were given but it was stated that the new process is nearly ready for large-scale production. A good deal of amusement was manifested when Mr. Blough told of a letter from Mr. Charles Hall to his Sales Department, dated about 1890, complaining bitterly that the Company's production of 40 lbs. of aluminum per day was not being sold and that something had to be done about it. The increasing use of aluminum in the construction of railway passenger coaches was an interesting item in the list of new applications of the metal.

On the whole, the exposition and the gathering of the four societies which held technical meetings in Detroit during National Metal Week must have been gratifying to the sponsors of what was certainly the most elaborate affair of the kind so far attempted. In addition to the technical features, there were plant-inspection trips to a large number of Detroit's diversified industries and a most comprehensive entertainment program, in which the ladies, of course, were not forgotten. Such a gathering has the advantage of enabling one to accomplish a great many different things in one place and in a short space of time. The only serious disadvantage lies in the fact that for many of those in attendance it is impossible to reconcile conflicting interests when each half-day's program presents so many events of importance occurring simultaneously.

Foundry Floors

By E. D. GLEASON

The Copper and Brass Research Association, at one time, estimated the loss by corrosion annually at $600,000,000. It would be safe to hazard a guess that this amount and more is lost in the same length of time in the average foundries in the aggregate of "spills" and through the sands of foundry floors. A great many of them compare with a newly ploughed field over which, when carrying a pot of hot metal to pour off, the slogan should be "watch your step." To avoid this a good foundry floor can be laid by the average molder that will be a credit to the foundry and a pleasure to work on and which will resist the heat of hot metal from overflowing molds and spills from the crucibles. It will stand the wear and tear of a running truck when carrying off castings.

This floor consists of equal parts, by volume, of Portland cement and No. 60 asbestos fibre by measure. It is not costly; Portland cement is worth about $19 a ton and the asbestos fibre $60 a ton. After these elements are thoroughly mixed together in the dry state, sufficient water is added until the mass is about like molding sand, so that it can be tamped and rammed, or mixed to the consistency of a heavy mortar and trowelled and smoothed off. Of the two, tamping has the preference for the floor will be hard in a few hours, and if put down at night, can be used the next day.

Before laying this floor, remove the loose material and put down some cinders. Ram them good and hard and over this lay the asbestos cement. No ordinary amount of heat will injure it, for asbestos and cement are highly resistant to heat. Should anyone rest a pot of hot metal on this floor it will not crack and fly to pieces like the conventional Portland cement floors and walks.

A somewhat tougher floor but a little higher in cost can be made with 7 parts asbestos fibre and 3 parts Portland cement, but with this mixture the floor should be entirely rammed or tamped. These floors will save money for all loose metal will be in sight and can be easily gathered up.

British Naval Brass Specifications

The British Engineering Standards Assoication, which has just received a grant of $5,000 in aid of its work from the Institution of Electrical Engineers, has issued two specifications for naval brass bars and sections.

The first covers the composition ("Admiralty Mixture") most commonly employed, but, as there is a growing demand for the alloy known as "Special Mixture," it has been thought desirable to incorporate it as a British standard. Otherwise the specifications are identical. They cover the ordinary sizes of round, square and hexagon bars (for which margins of manufacture are tabulated) and also for the more complicated forms of sections largely used in the manufacture of parts for electrical apparatus. In the table of hexagon bars the corresponding BSW, BSF, and BA sizes of bright hexagon nuts and bolt heads are given so that suitable bars for producing these can be at once selected.—A. C. B.

Smelting Secondary Tin

The Metallurgical Treatment of Tin Residues—Conclusion*

Written for The Metal Industry by E. R. THEWS, Metallurgist

TIN-LEAD ALLOY

Disregarding the more or less diluted final product, the tin-lead process appears to be much more suitable than the tin-iron process above outlined. The tin-lead alloys produced do not, as a rule, contain more than 20 percent of tin. The lower the tin contents of the lead used for the de-tinning of the foul slags, the more pronounced its alloying capacity for tin, of course.

Still better results, that is to say, a still more perfect de-tinning of the foul slags, may be obtained by using lead-antimony alloys as extraction agents. It is self-evident, of course, that neither metallic lead nor lead-antimony alloys are used for this purpose, but the corresponding ashes or slags. However, if metallic or semi-metallic smelter residues, such as dross, hardheads, scums, etc., are available, these may also be used as de-tinning agents, alone or in connection with ashes.

All lead or lead-antimony ashes or slag holding at least 30 to 35 percent metallic contents, excepting strongly oxidizing oxides, such as accumulator material, red lead, etc., may be employed. If suitable ashes or other similar materials are not available, roasted lead ores can be used to advantage.

In order to prevent the formation of iron sows, sulfur or arsenic compounds should be added in sufficient amounts, which combine with the excessive iron to form speiss and matte. Of these two additions, arsenic compounds are by far the more difficult to treat for the following reason:

If considerable amounts of speiss are present in smelting the products, these may cause the formation of serious obstructions, a difficulty due to the fact that all the arsenic-iron compounds, from Fe_2As to Fe_4As, are very viscous and, consequently, very easily chilled. The only comparatively easily fusible iron-arsenic compound is Fe_3As. Thus, obstructions due to chilled speiss may be due to lack of iron, although an excess of iron in the speiss above the proportion fixed by the formula given will have the same effect on the fusibility of the slags produced. As a rule, the arsenic is added as a very arsenical iron speiss containing 25 to 30 percent of arsenic.

Since it is often quite difficult in case of trouble to determine with sufficient rapidity which one of the two constituents is present in excess, and since it is rather risky to try this out by reducing or increasing the quantity of one of the elements, many smelters prefer to add sulfurizing agents instead of arsenic, thus producing matte, which is much more easily worked than speiss.

BLAST FURNACE FUEL

In contrast to the smelting of tin ashes, the slag cleaning operations should not be accelerated too much if the best reducing effects are to be obtained, since in view of the value of metallic tin, chief attention must be paid to the most thorough cleaning of slag possible. Indeed, the process which, on account of the fusibility of the slag, would proceed with considerable rapidity, is usually retarded on purpose by replacing the ordinary thick walled smelting coke with common gas coke which crumbles in the furnace, thus obstructing the passage of the air blast and reducing the speed of the process.

The same results may be obtained in a much more efficient way of adding a certain percentage of charcoal to the smelting coke. As a rule, 2 to 2½ percent of charcoal are thus added to replace about 2 percent of the 8 percent of coke usually added to the charge. Apart from its retarding influence on the speed of the process, this charcoal addition possesses a distinctly favorable metallurgical influence on the de-tinning of the slag, a recognition which has frequently led to the replacement of the largest part, or even of all, of the smelting coke by charcoal.

The chief advantage of using charcoal instead of gas coke for this purpose may be seen in the much better control of the retarding influence of these additions. The methods of production of gas coke are by no means as perfectly controlled scientifically as those prevailing at the production of smelting coke, and the mechanical and chemical properties of the former are, for this reason, correspondingly more uncertain. Charcoal, on the other hand, is a comparatively very uniform product if purchased from reputable firms, and it is possible, therefore, to adjust the percentage added to the respective conditions of the process.

The simplest, although somewhat dangerous method (if carelessly applied) to retard the speed of the process, is the addition of suitable amounts of coke breeze to the charge. This material must consist of crushed smelting coke of best quality, the ordinary coke sweepings or washed coke regained from firing residues being worse than useless, since a large percentage of this material is not burned by the blast but, together with slags, speiss, etc., will form secretions above the tuyeres. The grain size of the coke breeze added should not decrease below ¼ inch.

THE REVERBERATORY FURNACE PROCESS

In order to avoid the disadvantages of the blast furnace process above indicated, ashes and other materials rich in tin are usually smelted in reverberatory furnaces.

The reverberatory furnace used for the treatment of tin ashes and residues are about 7 to 10 feet long (hearth) and 5 to 6 feet wide, the inclination of the hearth towards the tapping hole being about ½ inch per foot and the concavity of the hearth about 5 to 7 inches in all. Fig. 3

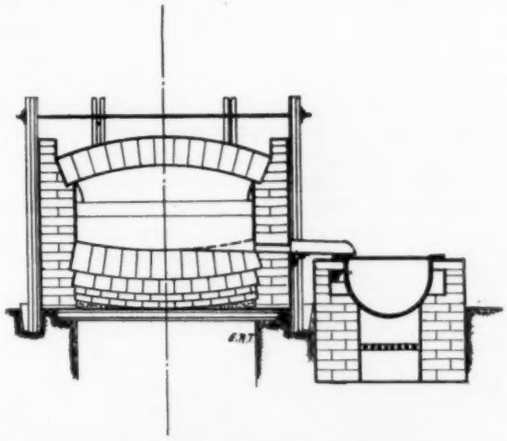


FIG. 3—TIN SMELTING REVERBERATORY FURNACE

* Part 1 was published in our September issue.

shows the construction of a typical tin smelting reverberatory furnace, with receiving pot, as used in Europe.

It is known that tin possesses a much stronger penetrative action towards the brickwork of the furnaces than lead, and it is necessary to consider this property in the construction of the furnace. The hearth is usually composed of four layers of bricks, the top layer of which is made up of high quality fireclay bricks standing on end. The second layer of bricks, laid sideways, should also consist of high grade material, whilst the two lower layers consist of ordinary fireclay bricks (3a Seger cone) laid flat.

The hearth is laid upon heavy cast iron plates extending about 2 inches beyond the brickwork of the furnace on three sides. Attention is called to the arrangement shown in Fig. 3-a where the bottom plate is slightly declined towards the firebridge where it rests upon a trough commonly made up of a large size U iron. Thus, the tin

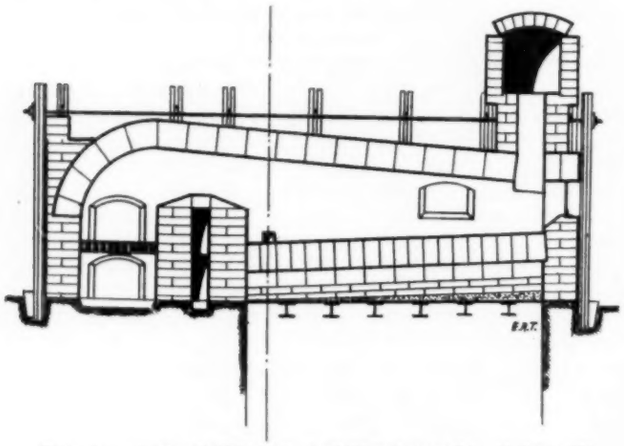


FIG. 3-a. TIN SMELTING REVERBERATORY FURNACE

penetrating through the hearth is collected and may be re-used immediately.

The bottom plate rests upon heavy girders stretched across a cellar or vault which should communicate with the cool outside air, best results being attained if a draft is created within the vault by providing two channels, entering at the bottom and at the top of the vault.

The construction of a water vault beneath the furnace, such as are used in the tin ore smelters at Singapore, or in connection with antimony smelting furnaces, appears to be exaggerated in this case. The same is true of the building of the furnace in a wrought iron pan. The furnace must be heavily armored with cast iron plates on all sides, of course, but need not be set in an expensive pan.

The arrangement above described is the most advantageous for the purposes of the tin reverberatory furnace, since the cooling influence of the cold bottom plate will prevent too copious a flow of tin through the hearth, or even freeze up the tin penetrated to the bottom plate, thus closing up the hearth and preventing further loss of tin or tin alloys from this source.

Attention should here be called to two features, the importance of which are not, in view of the comparatively high temperatures involved, sufficiently realized by most builders of reverberatory furnaces.

1. The two working doors usually provided should both be located as near to the entrance of the flue as possible. The larger the distance between the working doors and the flue, the longer the way of the cold air sucked in by the draught through the furnace whenever the doors are opened, and the more pronounced is the cooling effect exerted. For the same reason the furnace should be worked through the door next to the flue whenever possible. The door most favorably located in this regard is the one provided at the narrow side of the furnace directly below the flue, since the air drawn into this door is sucked right into the flue without passing through any part of the furnace.

To avoid this disadvantage, provision may be made for the insertion of a fireclay slide in the descending flue which is closed whenever the working doors are opened for any considerable period. Another way of avoiding through-draft within the furnace is the insertion of a few loose bricks into the walls of the flue which are removed while the working doors are opened, thus cutting off the draught from the furnace. This latter method may only be applied, however, if no other furnaces are served by the same flue channel, and if the general chimney is not loaded to its fullest capacity, because it will cause the entrance of large volumes of cold air into the flue system, followed by a proportionate reduction of the drawing effect of the chimney.

Mention should here be made of an interesting and unusual feature concerning the working doors proper. While in most cases the working doors of reverberatory furnaces are closed by iron-framed firebrick plates hanging on steel ropes and counterbalanced by steel weights, the best practice is to close them much more simply with tightly fitting iron plates about 1/10 inch thick and fitted with an angle iron at the lower edge. Above the center of the plate it is perforated by two holes, about 3 inches apart, through which the prongs of a fork are inserted when lifting the plate in and out. These holes serve also to observe the interior of the furnace.

The main advantages of this device are the simplicity and cheapness of construction, the stability, and the simplicity of operation. Besides, it permits of an easy control of the interior of the furnace, while the coloration of the plate serves to indicate the approximate heat of the furnace. The amount of heat radiated is negligible, of course.

2. The other important feature above alluded to is the shape of the flue where it leaves the furnace. In almost all cases which have come to the attention of the author, this part of the flue was made square, or almost square, the same as the rest of the flue. Thus, with a required cross-section of flue of, say, 225 sq. in. the flue is usually made about 15 x 15 inches.

There can be no doubt that this construction is very wasteful of heat, indeed, since the same drawing effect may be attained if a flue of this cross-section is flattened out against the narrow front side of the furnace to measure 30 x 7.5 inches. It is clear that by this arrangement the hot furnace gases have 7.5 inches more to travel before leaving the furnace. Besides the firing gases are not drawn together towards the middle of the roof and away from the two sides, and it will be found that after flattening out the flue as described, the material deposited in the two extreme front corners of the hearth will be much hotter than with the square type of flue usually constructed. Above the roof of the furnace this cross-section may be changed to a square again, or to any other shape desired.

There is another feature still which will raise the heat efficiency of the furnace, namely, the shape of the roof, which should be drawn down towards the flue end of the furnace as much as is compatible with the easy working of the charge from the working door located at the narrow side of the furnace.

MIXING CHARGES

In treating tin ashes containing, besides small amounts of metallic tin, lead, etc., metallic oxides almost exclu-

sively, it is unnecessary to add slagging materials. Soda-ash should not be added, since this flux, which in smelting tin ores may frequently be used to advantage for thinning the slags produced, serves no practical purpose in treating the oxide residues except corroding the lining of the furnace. Metallic iron contained in the residues should first be removed by magnetting.

Residues containing considerable percentages of metal, such as skimmings, dross, hardheads, etc., should first be treated in melting pots or liquating furnaces in order to remove as much of the metallic contents as possible. The same purpose may be attained by adding these metallic residues to fused lead or lead-antimony alloys poor in tin. If they contain considerable quantities of sulfur, arsenic, iron, copper, or antimony, they should be subjected to a combined roasting and liquation treatment in the reverberatory furnace, raising the heat gradually until a hard powdery material remains which is added to tin ores or other tin materials smelted in blast furnaces.

This old liquating treatment has now been replaced by the modern segregation process by which 4 or 5 tons of the material concerned are collected and charged into a reverberatory furnace in small lots of about 500 lbs. each until the furnace is half filled with metal. The ashes collected on top of the metallic bath are then drawn off and fresh material charged until the furnace is almost filled with metal. After removing all of the ashes, the metal is heated to a temperature of about 1450 deg. Fahr. and the arsenic removed by washing the metal with thin iron scrap, such as wire, sheets, etc. Firing being continued, the temperature has gradually been raised to 1550 to 1600 deg. Fahr., and it is now puddled for about 10 minutes in order to remove all of the zinc and part of the sulfur present. It is not necessary to remove all of the sulfur present at this stage of the process, since the metal will be entirely desulfurized at the final steaming.

The metallic bath is now cooled down as rapidly as possible, firing being stopped and all working doors opened, until a hard crust about 1 inch thick has been formed, when the white metal below is tapped.

The process is concluded by again heating up the furnace until all of the white metal adhering to the dark crust has been eliquated. The residues are removed and added to the blast furnace charge.

SMELTING TIN ASHES

The tin and tin-alloy ashes are treated as follows:

Immediately previous to charging, the ashes are mixed with about 12 to 15 per cent of powdered magnesite and moistened in order to prevent excessive dusting. After charging, the furnace is closed and luted tightly and the temperature slowly raised to 1850 deg. Fahr. About one hour after reaching this temperature the "moist" material is rabbled thoroughly, 2 or 3 shovelfulls of ground anthracite added, the charge again spread out, and subjected to the heat for another half hour, and this treatment continued until the hearth has filled with a bath of metal. In rabbling, care must be taken not to stir up the metallic tin more than absolutely necessary. A reducing atmosphere must be maintained in the furnace.

The metal should be tapped at the end of the treatment of each charge. The practice of some smelters to leave the tap hole open throughout the entire process in order to prevent the oxidation of the reduced metal in the hot furnace is not to be recommended, since on account of the cold air which is constantly drawn through the tap hole, the tin or tin alloy passing through in very thin streams will tend to freeze up within the hole, thus occasioning constant trouble. This disadvantage may be eliminated by installing a gas burner in front of the tap hole which directs a long reducing flame into the channel maintaining the temperature of the air passing into the furnace at a temperature well above the melting temperature of the metal. A branch of this burner may be passed along about 4 inches above the spout, protecting the metal flowing down it against freezing by means of 6 to 10 thin flames directed downward.

In contrast to the smelting of tin ore, the reverberatory furnace method of smelting tin residues is comparatively simple if the high temperatures necessary are maintained. If the slag produced is too viscous for satisfactory treatment, a little fluorspar may be added.

The semi-melted residue remaining on top of the metal at the end of the process is mixed with a few shovelfulls of unslacked lime, the mixture rabbled for a few minutes and exposed to the full heat of the furnace about 30 minutes. By this treatment, a large part of the metal mechanically suspended in the residues in form of small pellets is liberated and returned to the metallic bath. Care must be exercised, however, not to add too large an amount of lime, since this will destroy the slaggy nature of the residues which assumes a dry, powdery consistence and becomes unsuitable for blast furnace treatment.

In this connection, mention should be made of the so-called "tin ashes" produced in the lead refining process which contains about 5 to 15 per cent of tin, the exact amounts of tin depending upon the percentages of tin contained in the lead and upon the speed of oxidation. The less intensive the oxidizing effect exerted, the higher the percentages of tin concentrated within the ashes. If this material is treated with the object of extracting both tin and lead, comparatively very high temperatures and strongly reducing conditions must be maintained.

However, if the melting process is carried out at temperatures below 1500 deg. Fahr., and in a neutral or even slightly oxidizing furnace atmosphere—the only reducing agent being about 5 per cent of ground anthracite present

The tin alloys produced in the reverberatory and blast furnace processes are chiefly lead-tin alloys containing 20 to 75 per cent tin, of which those containing up to about 35 per cent tin are used for the manufacture of ordinary lead-tin or lead-tin-antimony alloys, while products with more than 35 per cent tin should be employed for the production of "tin alloy" and alloys rich in tin used as base alloys for the manufacture of tin solders on the one side and for high grade bearing metals on the other.

In addition to the deductions offered in that article, attention should here be called to the fact that the liquation process may also be used in concentrating the tin contents of alloys containing more than 60 per cent of tin.

This process is based upon the fact that the melting temperature of the tin-lead eutectic containing from 55 to 62 per cent of tin (depending upon the amount of antimony and other impurities present) is 360 to 365 deg. Fahr., these temperatures increasing with rising as well as with decreasing percentages of tin. If, therefore, a material containing, say, 70 per cent of tin is deposited on the inclined hearth of a reverberatory furnace and carefully heated to a temperature of about 370 deg. Fahr., the eutectic alloy will be "sweated out."

Tin alloys contaminated with impurities, such as copper, arsenic, sulfur, etc., may be refined by the method described for the cleaning of metallic residues.

Electric Refrigerators

A general conference of manufacturers of electric refrigerators and refrigeration material was held in Cleveland, July 27, 1927. The purpose of the meeting was to determine on a simplification program to be carried out during the coming year.

British Institute of Metals Meeting

Abstracts of Papers Presented at the Annual Autumn Meeting Held in Derby, England, September 6-9, 1927

METALS IN MODERN TRANSPORT

Dr. L. Aitchison, of Birmingham, gave the opening lecture of the annual meeting of the Institute of Metals at Derby on Tuesday, September 6th, under the chairmanship of Sir John Dewrance, K.B.E., president of the Institute.

Dr. Aitchison said that the reasons for the employment of the non-ferrous metals in our various systems of transport are very similar to those that govern their utilization in all other branches of engineering. The non-ferrous metals and alloys are only needed when they can offer certain chemicals or physical properties that are required by the engineer and that are not possessed by iron and steel. In general, the properties that lead to the greatest employment of the non-ferrous metals and alloys are:

(1) A high resistance to corrosion.
(2) High values of thermal or electrical conductivity.
(3) A low value of specific gravity.

In addition, the properties of ease of machining, ease of cold working and simplicity of casting contribute to the wider usefulness of the materials.

The use of non-ferrous metals on account of high electrical or high thermal conductivity is particularly illustrated by the purposes to which copper is put. This metal enters very extensively into the construction of electrical plants, whilst its thermal conductivity is made use of in boiler tubes and the like.

A high resistance to corrosion is a conspicuous feature of nickel and its alloys. These metals are not very extensively used in connection with transport systems, but a fairly prominent example of this service is found in cupronickel condenser tubes. Many examples of good resistance to corrosion are found in the alloys of copper. Typical illustrations of the use of this metal and its alloys on this account occur in condenser tubes and turbine blading, as well as in gun metal and phosphor bronze castings, which are extensively employed in ship construction.

The use of metals having a much lower specific gravity than iron and steel, and having at the same time mechanical properties which are comparable with those of the ferrous metals, is of great importance in transport systems. The alloys that are actually employed are those based upon aluminium and magnesium. The alloys of aluminium at the present time are, of course, much more extensively employed than the alloys of magnesium, and the aluminium materials find their way into a great many parts, both in the cast and in the wrought condition. A variety of aluminium casting alloys can be employed, and are more or less interchangeable, but the majority of the wrought parts are made in Duralumin. The way in which weight saving can be achieved by the adoption of light alloys, is illustrated in the lecture by reference to the method of construction of rail coaches and food containers, and to their use in constructing panels and structural sections in tramcars, motor cars and motor buses. In addition, aluminium alloys are extensively used for a large number of castings that are incorporated in automobile engines, whilst in the wrought state they serve admirably in a number of engine parts and in the structure of the vehicle.

An important branch of modern transport is that comprised by aeroplanes, seaplanes, flying boats and airships, and in all these branches of transport, lightness is a property which is prized very greatly. The employment of the non-ferrous metals in these different forms of aeronautical structure, as well as in the engines that are employed to drive them, afford very interesting examples of the value to the engineer of the low specific gravity of the light aluminium alloys—these being one-third of those of the irons and steels.

Another field into which non-ferrous metals enter very largely is that of anti-friction materials. These are of various kinds, having tin, or lead, or copper as their basis. They are able to function in a way that no steel or iron is able to rival.

The Under-Cooling of Some Aluminium Alloys. By Marie L. V. Gayler.

The effect of under-cooling on the macro- and microstructure of some silicon-aluminium and copper-aluminium alloys has been studied. It has been found impossible to under-cool "modified" silicon-aluminium alloys systematically, and it has been shown that the curves of solubility represented by the "modified" diagram correspond closely to the supersolubility of the "normal" alloys.

The Constitution of Alloys of Aluminium with Silicon and Iron. By A. G. C. Gwyer and H. W. L. Phillips.

The first part of this investigation deals with the constitution of binary alloys of aluminium with silicon and with iron. The eutectiferous nature of the aluminium-silicon system has been confirmed, and special attention paid to the solubility of silicon in solid aluminium. The position of the Al-$FeAl_3$ eutectic has been redetermined, and the structure of the alloys lying towards the middle of the constitutional diagram has been, it is thought, elucidated.

The second part deals with the constitution of certain of the ternary alloys of aluminium, silicon, and iron, under both equilibrium and metastable conditions. The latter are of considerable practical importance, because they are met with not only in commercial alloys, but also in commercially pure aluminium.

The Equilibrium Diagram of Copper-Tin Alloys Containing from 10 to 25 Atomic Per Cent. of Tin. By A. R. Raper.

This investigation on the copper-tin alloys forms a continuation of the work done by Stockdale on this system. The alloys have been examined both by thermal and micrographic analysis, and the results obtained have confirmed in many respects the classical work of Roberts-Austen and Heycock and Neville.

The $\alpha+\beta$—β boundary has been carefully determined micrographically. This boundary shows a sudden change in direction at 580°, which together with other micrographic evidence favors Stockdale's view of a polymorphic change of the β constituent.

The eutectoid point has been found to be at Sn 16.15 (or 73.15 per cent Cu by weight), the temperature of the inversion being 520°.

The "transformation" curve has been determined carefully by thermal analysis, and the results are entirely in agreement with those of Roberts-Austen and Stansfield. In particular, the slight horizontal indicated by them at about 610° has been confirmed. As determined by the present author, it exists from Sn 22.5 to Sn 25 at a temperature of 638°. The inclusion of this new horizontal in the diagram makes the interpretation of this region

easier, and evidence for a new eutectoid at Sn 23 has been obtained.

Effect of Work and Annealing on the Lead-Tin Eutectic. By F. Hargreaves.

A marked softening action of work at air temperature on the lead-tin eutectic is found, and the effect of different degrees of working is investigated. In the case of 78 per cent reduction in thickness, the Brinell hardness is reduced from about 14 in the chill-cast condition to 4.2 when tested immediately after hammering. This value is actually lower than that of either constituent in the pure state. Annealing at air temperature and at 100° C. for different periods is carried out, and the effect on the rate and extent of recovery in hardness determined. Finally, the effect of annealing at just below the melting point is recorded. Little micrographic work is recorded. Reference is made to the relationship of well-known phenomena to the results obtained.

Researches on Intermetallic Compounds. VI.—The Reaction Between Solid Magnesium and Liquid Tin. By William Hume-Rothery.

The reaction between solid magnesium and liquid tin has been studied between 250° C. and 350° C. in order to see whether reactions of the type

Primary solid X+liquid=secondary solid Y

can proceed when the solid phases concerned do not form solid solutions.

When a rod of magnesium is stood in a limited quantity of molten tin, the magnesium dissolves until the liquid reaches the equilibrium composition at the particular temperature concerned. Since, however, true equilibrium requires the compound Mg_2Sn (probably Mg_4Sn_2) as the phase in equilibrium with the liquid, a further reaction of the type

Solid magnesium+liquid=solid magnesium stannide

tends to take place, and the above point can be tested, since no solid solutions are formed.

The experiments show that when sufficient magnesium has dissolved to give the liquid the equilibrium composition, all further direct reaction is stopped by a thin film of magnesium stannide which shows no appreciable thickening even after three weeks at the above temperatures. On the other hand, a few large crystals of magnesium stannide are sometimes formed by a slow reaction. This is probably the ordinary phenomenon of crystal growth due to surface energy effects, since the thin surface film has a high surface energy and so tends to form a more compact mass. But any solution at one point exposes more magnesium to the action of the liquid, and so the reaction gradually proceeds.

The experiments are regarded as of interest in connection with the fundamental principles underlying soldering and other reactions between solid and liquid metals.

The Copper-Magnesium Alloys. Part II. By W. T. Cook and W. R. D. Jones.

This report deals with an investigation on the forging of copper-magnesium alloys, and is a continuation of that given on the casting of these alloys and the mechanical properties of chill-cast bars. The properties of the alloys in the forged and heat-treated conditions have been determined and examined. The ductility of these alloys depends primarily on the forging temperature. If this temperature be low the elongation and the reduction of area are impaired seriously, and the values are not restored by subsequent heat-treatment. The mechanical properties of copper-magnesium alloys containing up to 11 per cent copper are not improved by simple heat-treatment, which causes a general decrease in test values. The addition of copper to magnesium up to about 2 per cent is beneficial. Beyond this amount the increase in tenacity is small, whilst there is a regular decrease in ductility and a proportional increase in specific gravity. There is no advantage in adding more than this amount of copper to magnesium either for castings or for forgings. To obtain the best results the forging temperature must be controlled, and care must be taken to guard against any possibility of cold-shut when casting ingots for forging.

Grain Growth in Compressed Metal Powder. By C. J. Smithels, W. R. Pitkin and J. W. Avery.

The changes which take place in certain properties of bars of pressed tungsten powder when the temperature is gradually raised have been investigated. These changes are attributed to grain growth, which is shown to begin at a temperature determined by the particle size of the powder and the pressure used in forming the bar. Using powders whose mean particle size varied from 0.6 to 3.5_u, and pressures between 8 and 32 tons / $in._2$, the temperature at which grain growth could first be detected varied from 1100° K. to 1500° K. These conditions cover those usually employed in the technical preparation of ductile tungsten. The results are in conflict with those of Sauerwald, who was unable to detect grain growth below 2800° K., but are consistent with the established facts of grain growth in worked metals.

The Constitution and Physical Properties of Some of the Alloys of Copper, Zinc, and Cadmium. By C. H. M. Jenkins.

The constitution of the copper-zinc-cadmium alloys has been studied, and the physical properties of the two most commonly used brasses containing small proportions of cadmium investigated.

The study shows a complex constitution in the range of the ternary system where the copper content exceeds 45 per cent and the cadmium content is less than 10 per cent. The solid solubility of cadmium in α brass diminishes with increasing proportions of zinc from a maximum value of 2.7 per cent. Cadmium present beyond the proportion retained in solid solution is found to occur as the binary constituent, Cu_2Cd. The alloys whose constituents are α brass and more than a trace of Cu_2Cd commence to melt at comparatively low temperatures between 549° and 614° C. Traces of free Cu_2Cd on heating dissolve in the α phase without melting, owing to the slightly increased solubility at higher temperatures.

A peritectic reaction, in which the β phase of the Cu-Zn system reacts with liquid to form the α phase and Cu_2Cd, occurs in this system at 614° C., considerably affecting the properties of the alloys. This reaction is primarily due to the result of the two peritectic reactions found in the binary copper-zinc and copper-cadmium alloys, at 906° and 549° C. respectively.

The effect of cadmium on β brass is noticeable in a different manner. This phase shows a greatly increased solid solubility for cadmium with increase of temperature reaching a maximum value at 8 per cent. At low temperatures the γ constituent to have a greater power than the β phase of retaining cadmium in solid solution.

The effect of cadmium on the physical properties of 70:30 and 60:40 brass has been studied by the use of cadmium-bearing zinc containing proportions of cadmium decidedly in excess of those likely to be encountered in retort zinc. The results show that the greater proportion of the cadmium content of the zinc is retained in the brass and is not lost by oxidation or volatilization during melting. The presence of less than 0.2 per cent of cadmium seems to prevent the hot-rolling of 70:30 brass and cadmium, and of more than 0.5 per cent, to increase to a slight extent the liability to unsoundness in cast material.

The general results indicate that the use of cadmium-bearing zinc does not produce any marked alteration in the physical properties of the brass. Additions of cadmium up to 1 per cent by weight cause an improvement

in the tensile strength, generally accompanied by a reduction in elongation. The effect is most noticeable in the cast 70:30 brass, and is less pronounced in worked material.

The Protection of Aluminium and Its Alloys Against Corrosion. By H. Sutton and A. J. Sidery.

Some experiments are described in which samples of aluminium and aluminium alloys were treated by various protective processes, including anodic oxidation, zinc-, cadmium-, and nickel-plating. Certain practical features of the methods investigated and, also, the results of corrosion tests extending over periods of 1 to 2 years, are discussed. The resistance of aluminium, Duralumin, and of certain other aluminium alloys to corrosion by seawater is considerably increased by anodic oxidation and the subsequent application of a grease, such as lanoline.

Electro-deposited coatings of zinc, 0.0005 in. thick, afforded better protection to aluminium than did coatings of cadmium of similar thickness, but the two types of deposit appeared to give an approximately equal degree of protection when applied to alloys of aluminium. Unsatisfactory results were obtained from nickel deposits of normal thickness. Comparison is made between anodic oxidation and zinc-plating or cadmium-plating as methods of protecting aluminium or aluminium alloy parts of aircraft.

The Nature of the Film Produced by Anodic Oxidation of Aluminium. By H. Sutton and J. W. W. Willstrop.

A method of isolating the film from anodically treated aluminium is described. The metallic aluminium is volatilized in dry hydrogen chloride. The properties of the film so obtained are described, and the thicknesses of films obtained under various conditions have been calculated. The films isolated from treated commercial aluminium sheet are usually of a grey color, due to traces of carbon left behind when the aluminium sublimes as chloride. The presence of elementary silicon in films produced on commercial aluminium is also shown. Films varying in thickness from 0.033 μ to 2 μ have been obtained, the thickness of the film produced by the usual standard treatment being about 1 μ. From the volume of gas evolved by treated aluminium when heated *in vacuo* to 1200° C. the film is shown to consist of oxide and not of hydroxide.

The System Magnesium-Cadmium. By Wm. Hume-Rothery and S. W. Rowell.

The equilibrium diagram of the system magnesium-cadmium has been investigated by thermal and microscopic methods. The system is shown to contain a solid solution based on cadmium and denoted α, a definite intermetallic compound $MgCd_2$, and a solid solution in magnesium denoted β. The solid solution α extends from 0 to about 24 atomic per cent magnesium at most temperatures. The compound $MgCd_2$ does not form any solid solutions, whilst the β solid solution extends from about 40 to 100 atomic per cent magnesium.

The solidus and liquidus are shown not to meet at the composition 50 atomic per cent as reported by the earlier workers. The β solid solution undergoes a transformation at temperatures about 200° to 250° C., but the maximum temperature of this change is at 54 atomic per cent, and not at 50 atomic per cent as previously reported. This change is unaccompanied by any alteration in microstructure, and it has not been possible to obtain any two phase alloys in this region either by slow cooling or by quenching. It is suggested that the change is of the same nature as that of the β brasses.

It has been shown that prolonged annealing is necessary to attain equilibrium in the solid alloys in the neighborhood of the compound $MgCd_2$, and the principal differences between the present and the earlier work are due to the fact that the former investigators did not anneal their alloys for a sufficient time.

Straightening Reamers

Q.—Can you furnish me with the best method or formula to use in hardening carbon steel reamers to keep them straight. The long, small diameter reamers give me the most trouble.

A.—It is almost impossible to keep a long reamer perfectly straight but a piece of channel iron that is straight can be employed when tempering and will help considerable.

Lay this flat in the fire or furnace and have it heated as evenly as possible. Lay the reamer in the channel and roll it from side to side until you get the right heat. Quench straight down in the water and keep it moving up and down until the steel has finished sizzing. Then put it in a warm oil bath to cool. This will keep the reamers fairly straight.—P. W. Blair.

Brazing

Q.—Can you advise me how to braze or weld malleable fittings on steel tubing such as are used on bicycles c. small velocipedes, on a production basis.

A.—As the two pieces to be brazed must be thoroughly alloyed with the material used for brazing, the temperature must be raised and maintained at such a point that inter-penetration can take place completely. For brazing, a red heat is necessary and borax used as a flux to prevent the metal from oxidation or to dissolve the oxides formed. Before work is assembled for brazing it should be carefully cleaned. The parts are then fastened together in the position they are to occupy when joined together. Usually the pieces are pinned or held by wire. If practicable they should be secured in such a way that the work can be turned over during the process of brazing without disturbing the relation of the parts, thus affording a better chance to apply the flux and spelter. Heating should be effected by a blowpipe blow-torch gas forge or a coke or charcoal fire.

The principal difference between dip brazing and ordinary brazing is that with the former method the work is immersed into the molten spelter until the parts are heated sufficiently to be united by it. This method is extensively employed in bicycle manufacture as it is more economical for duplicate work and a production basis.—P. W. Blair.

Aluminum Cans

As a result of exhaustive investigations recently carried out by the German Aluminum Research Institute, under the technical direction of Herr Serger, it is now claimed that aluminum cases and cans for oil and preserved vegetables, fruit, etc., if the aluminum is treated by a special process, will serve as well as tinned sheet containers, and that the aluminum has no harmful influence on the contents. Following this investigation a number of the leading German canners and preserve manufacturers are reported to be introducing the aluminum sheets made under the Serger process. The wholesale adoption of this processed aluminum would mean a substantial reduction in Germany's imports of tinplate and seriously affect the tin industry.—A. C. Blackall.

Aluminum Alloys and Their Castings

An Article Describing Current British Practice in Aluminum—Conclusion*

Written for The Metal Industry by WALTER BANNARD, Metallurgist

SAND, PERMANENT MOULD AND PRESSURE CASTINGS OF ALUMINIUM ALLOYS

PART II.

SAND CASTINGS

It is rather surprising that this extremely ancient method of obtaining castings is still in extensive use, in fact, forms the only method employed for the bulk of the immense output of castings despite the fact that the technique has hardly undergone any change during centuries, when of course it was employed for brass and iron molding.

Furthermore, it is very difficult even in the light of the latest scientific knowledge to see how any great improvement upon the method can be effected. The first apparent disadvantage is that for every casting a perfectly made mould is required and which is entirely destroyed when that casting has been made. This is not so serious, however, because modern design and pattern making methods are tending in the direction of simplicity which, together with the use of moulding machinery for cope and drag and a good piece work price, it is surprising what large quantities of sand moulded castings can be made in a day by a man and a boy working together. In fact, it is often found that a job can be more economically made in sand than it could be in a permanent mould.

One of the defects of sand castings is their surface appearance, which is always somewhat rough, and along this line some research is certainly needed. The surface roughness referred to is due to the "searching" property of the alloy which reproduces most faithfully the minutest impressions in the mould such as the superficial spaces between contiguous grains of sand. On flat or simple surfaces, where graphite powder can be dusted on and sleeked over the surface, the resultant casting is much more smooth because the small surface cavities referred to are largely filled up, but on any but the simplest surfaces this method cannot be applied for obvious reasons. Sand casting will most probably hold its own against the newer processes quite indefinitely, for manufacture of the larger castings, such as crank cases and gearboxes of automobiles; at any rate, this will be the case in England, where except in the cases of one or two motor makers the quantity required would not warrant the expense of the necessary die and its operating mechanism, were permanent mould work desirable from other points of view.

By reason of their moderately slow rate of cooling in the mould, sand castings are not the strongest obtainable from a given alloy; their mechanical properties are probably intermediate between those of permanent mould castings and pressure die castings.

There is advantage, from the founder's point of view, about sand castings, that chills, risers, runners and gates can be placed anywhere at will and be varied from one casting to the next until the best position is found by experiment, whereas with the other two methods of casting little can be done after the die has been made, and it is necessary to think very carefully where best to run and feed from in that case.

The first thing to do on considering a new job to be sand cast is to decide on a simple gating and running system which will ensure an even distribution of the metal and a moderately slow filling of the mold. It is well to consider which way the gases will go on pouring the mold and provide big vents, preferably in the form of adequate risers. Risers can cope with most of the troubles such as cracks, draws, sinks, shrinks and porosity in sand castings, and it is well to make them as big as is economically possible and without spoiling the appearance of the casting, remembering at the same time that they have to be cut off, and so must be accessible preferably to band-saw and file, although other methods for removing them are employed in special cases. What of the above defects risers won't take care of, can generally be cured by the judicious use of either iron, brass, or aluminium, chills, and a pouring temperature as low as is compatible with the entire filling of the mould and sharp definition at corners, edges, and the like, where if the metal arrives too slowly or too cold, larger radii than desired are sometimes formed. Experiments with simple shapes, tees, flats, horizontal and vertical angles, etc., with and without chills and risers, if conducted in a systematic way can tell much of the first principles of aluminium founding.

It seems in most cases best that the alloy should run from the highest point in a mould and not run in from the bottom, but the fall should be a gentle incline where possible so as to avoid splashing and entrainment of air and oxide.

Porosity is often due to having an entering runner half way up the mould whereby entering metal has to surge through metal already there in order to reach the highest parts and so fill the mould. This also sets up solidification stresses. Bottom pouring has few advantages, indeed. The metal which arrives in top risers or feeders is the coldest metal in the mould and so is the first to set. Under such circumstances it cannot play its part as a molten reservoir to feed parts below as they in turn solidify and shrink.

Runners should be so devised that metal may not spurt onto a core, especially an oil sand core, on entering. In the former case a hot spot is formed which may give rise to porosity, and in the latter case gasses may be evolved, which, if the casting is a totally enclosed one such as a water jacketed cylinder head, may burst the pasty jacket in places and give rise to porosity.

For castings such as induction pipes and cylinder heads, which have to stand a substantial air pressure test, the runners should not enter at thin jacket walls as they are likely to cause porosity there.

Porosity and blowholes may be caused in big jobs with complicated coring by attempting to dry chills with gas torches which may deposit moisture upon them, this being converted to steam when the metal is admitted. The accuracy obtainable with sand castings is apt to be rather variable, and the more so the fewer are the number of castings being made off one pattern in a day. With machine molding and all the best appliances, the rapping applied to each mold is either performed mechanically or becomes well gauged by the frequent repetition which the operator experiences. In hand-molding patterns are apt to be rapped varying amounts, and this, together with "sleeking," after the pattern is drawn, may give rise to serious dimensional errors.

Then again, a disadvantage of sand casting is that much metal has to be left on for purposes of machining. Wood patterns are liable to lead to dimensional errors by warping as they do in damp or very dry weather; this is

* Part 1 was published in our September issue.

a frequent cause of trouble, the patterns being taken out of the store and put into work without checking up in the pattern shop. Sometimes the defect is not noticed until a substantial batch of the castings have gone to the customer. Metal patterns are more satisfactory wherever their employment is feasible.

PERMANENT MOULD AND PRESSURE DIE CASTING

For a vast range of parts the employment of that method of casting aluminium alloys which will give in the resultant piece the maximum obtainable tensile strength, elongation, etc., is not by any means necessary. For some purposes the strength properties of the resultant casting may be of secondary importance in comparison with cheapness.

It is for this reason that pressure die castings—with admittedly inferior metallurgical properties, to say permanent mould castings—are employed to such a vast extent in the United States. Parts for vacuum cleaners, typewriters, gramaphones, adding or calculating machines and a multitude of other similar unstressed applications can, if the quantities required warrant it, be most economically cast by the pressure system.

Both gravity die casting and pressure die casting are rapidly proving to be an important factor in the manufacture of interchangeable parts where considerable accuracy and high finish are essentials. The application of the processes to the production of finished parts is very great since it is possible to die cast almost any piece. It is not, however, always economical or practicable to do so.

Nevertheless, there is an enormous volume of metal parts continually required in the various industries that can be successfully cast in dies.

GENERAL ADVANTAGES OF THE TWO METHODS OF CASTING IN DIES

The principal advantages of the die casting process are as follows. The process is continuous and the output generally much greater than in the case of sand casting. The castings are uniformly accurate, and machining costs are either entirely eliminated or very considerably reduced. Objects which it would be impossible to sand cast may be quite successfully die cast. All pattern making and molding costs are obviated once the die is made, and errors due to the human factor are thereby avoided; it is far easier to get perfect accuracy once and for all in the original die than with each separate casting. There is less chance of sand being included in the casting. Any small fins which may have formed can be removed by file card, grinding wheel or filing machine without the assistance of any elaborate jigs or fixtures. A 1-lb. die casting in aluminium, if made of cast iron, sand cast, would weigh about 3 lbs. and be only 30 per cent stronger. By the pressure system the possible output of castings is enormous. One multiple die can produce 300 small pieces per hour on a one-man operated machine. By the gravity method aluminum alloy castings, weighing ½ lb. each, have been obtained under normal conditions on an average of 500 a day, these being hand-poured. Naturally, with many cores to remove, one man cannot obtain the same output from the hand-poured die as on a pressure-operated machine. The size of castings which may be successfully die cast depends upon a number of factors, but, generally speaking, the process is best adapted to small parts.

By the pressure casting system oil rings and wheels 15 in. in diameter have been cast of aluminium alloys and holes can be cored accurately within 0.001 in. and have smooth interiors.

The limit of accuracy obtainable without special precautions is 0.002 in. and such accuracy is generally aimed for; much greater accuracy, keeping dimensions within 0.0005 in., can be attained, but requires considerable trouble in maintaining the dies in proper condition. Lugs and gear teeth may be cast in place and external or internal threads of almost any pitich can be cast. Internal threads, however, seldom pay because the core on which the thread is cast must be screwed out of the casting with consequent reduction of output from the machine; less time would probably be taken by tapping the holes. External threads can, however, be cast quite satisfactorily for sizes from 0.25-in. diameter upwards. Oil grooves can be cast in bearings.

By the gravity casting system the accuracy obtained is not of such a high order as in pressure work. But the accuracy obtainable is largely dependent upon the permissible cost of the die and the size of the casting.

A further point is that the insignificant weight of the head of metal, the only pressure employed is not sufficient to give that very close definition where the most minute impressions of the mold are to be faithfully reproduced.

Nevertheless, thus considered, accuracy is an entirely relative term, and it is important to remember that the gravity casting process gives infinitely greater accuracy than the sand casting process, and yet posesses so many other desirable features that its fields of application and utility are exceptionally wide.

A further and considerable advantage of these casting processes is that the labor required for operating the dies may be classed as unskilled.

DISADVANTAGES

The disadvantages of the processes for casting in molds are indeed few so long as each piece is made by the rightly chosen process.

The dies, even though moderately simple, with their mechanism for removing cores and ejecting the casting, take some weeks to make and are very expensive. It is in the reduction of time and expense for die manufacture that advance is most needed.

Some firms, however, work without mechanical core extractors or casting ejectors, and obtain fair satisfaction at a considerable saving in first cost. It is probable, however, that in the long run it pays to use some simple mechanism for both of these operations.

It is impractical to produce under-cut work—that is, work having no draft and which, therefore, is impossible to draw from the die. Such work can, of course, be done by the use of collapsible cores, but it is not advisable to employ them as they get out of condition and slow down the rate of operation. It does not pay to cast rough, heavy work, which can be made just as well by sand casting; in such large work the amount of metal required for each casting makes the cost prohibitive.

Pressure die castings are undoubtedly indicated when the quantity required is very large, where the walls are to be thin and where considerable accuracy is necessary in order to eliminate machining costs; for small and intricate shapes and parts which do not need to be absolutely sound and free from porosity and blowholes.

Pressure castings can be used for an enormous variety of parts to great advantage but they should most certainly never be employed for stressed members or parts which on failure would endanger life.

Gravity poured die castings have an immense field of application which so far has not been largely exploited, principally because the properties and capabilities of such castings have not been generally well known to engineers and designers.

Properly poured gravity mould castings are far stronger than the same castings made in sand, and they are not to

be compared with the brittle work of the pressure machine. They form a valuable link between reliable sand castings and drop forgings; so much so that dies costing anything from £3 to £300 to make are often enough embarked upon even though the total quantity of castings likely to be required is uncertain and may not exceed 1,000.

The high quality obtainable is the main point to be emphasized and this line of thought is likely to be overlooked in the search after quantity.

Gravity castings are inherently strong and sound and are normally much more free from porosity than sand castings. The reasons that they are stronger than sand castings are not far to seek and lie in the greater soundness and the chilling effect of the die which is well known to increase the tensile strength of all aluminium alloys.

Gravity or permanent mould castings, when carefully made, are uniformly sound throughout, with perhaps an occasional isolated blowhole here and there, while pressure castings have a thin sound surface skin but are porous beneath this layer. These latter are, of course, unsound by the nature of the process whereby they are manufactured.

Gravity poured castings should be specified where parts of reliable, indeed the highest mechanical properties are required, and in many cases they will be cheaper than sand castings.

When specifying for castings the price alone is not a sufficient guide, but the mechanical properties, soundness and such like features should be taken into consideration.

A pressure casting at a certain price might be totally unsuited for a given part, while a gravity casting at a slightly higher price might be eminently satisfactory. And in production, too, the gravity casting process used for suitable parts often works out cheaper than sand castings and sometimes even cheaper than pressure castings, since the equipment in the latter process, so very expensive, is altogether obviated.

Phosphor Bronze

Q.—I wish to ask you a question in regard to phosphor copper. We are using a mixture of 80-10-10 and have been having trouble with some of our heavy castings. The pig bronze we use has 62% phosphor copper in it and we have been using a pound and a quarter of 15% phosphor copper to 100 pounds of metal in the furnace.

We have tried these castings every way that we know how and they look all right on the outside, but when they are turned up, they are full of holes, the holes extending all the way through the brass, and they have a reddish color. We have cut the phosphor copper down to ½ pound to 100 pounds of metal and the castings have a good phosphor bronze color and there is not a speck in them.

I think that the phosphor copper was the cause of the trouble. I wish to ask you if phosphor copper would have caused the trouble, and will it cause phosphor bronze to be brittle and segregated over a certain per cent?

A.—There is no question from the experience you have had that the excess phosphorus or the ingot metal you are using is the cause of your trouble. We are inclined to believe your trouble is caused more from the ingot metal than the amount of phosphorus it contained. From the description you give that the castings are full of holes and the fracture has a reddish color, this would suggest the metal has been badly oxidized in melting and redeoxidized with excess phosphorus. We would suggest you make an analysis of the ingot metal for oxides, antimony, iron and zinc.

High phosphorus, that is over .50% in 80-10-10 metal containing over .10 zinc, .15 iron and .125 antimony will cause trouble similar to your trouble and excess oxides. At the same time it is harder to make good castings containing over .50 phosphorus than castings containing .15 phosphorus. In the first place the phosphor copper that is used must be free from iron and made from ingot copper. Phosphor copper made from scrap will cause trouble when the phosphorus content is over .15 in the casting. We have found this in a number of cases. In the second place, temperature of pouring is more essential in high phosphor copper. It must be poured at the time the metal will not take up any more metal readily, that is added for cooling. If properly handled castings of 80 copper, 10 tin, 10 lead can be made very satisfactory, containing one per cent phosphorus. Such castings are said to give longer life in service than the lower per cent of phosphorus in phosphor bronze.—WILLIAM J. REARDON.

Casting Weight Variation

Q.—What is the allowable variation in the weight of a number of bronze castings (85-5-5-5) from the same pattern; normal commercial castings?

A.—The allowance on variation in the weight of bronze castings depends on the weight of the casting in bronze castings. From 1 lb. to 5 lbs, 2% in a total of 100 lbs. of the weight; 5 lb. to 25 lbs. castings, 5% of the weight of 100 lbs. of such castings. Unless castings are made from the same patterns, weighing 1 lb. each and weigh them weight. Take a plate of 10 patterns, all supposed to be the same patterns, weighing 1 lb. each and weight them separately. You will find very often a slight difference in the weight of each casting. However, the allowance given above is about the average allowance on commercial castings.—WILLIAM J. REARDON.

Hard Spots in Aluminum

Q.—I am mailing you a sample aluminum casting and you will notice some small black spots and I would like to know, if possible, what causes this.

I use the fine grade Albany sand and the mixture of the aluminum is approximately Aluminum—90, Tin—7, Copper—3, and we pour at a temperature of 1,300 degrees F., which is about as low as we can run the job. Our molds are perfectly clean from loose dirt and yet we have a great deal of difficulty with these little black spots developing on the outside of the casting.

A.—On examination of sample aluminum casting we find the black spots you speak of to be what is known to the trade as "hard spots" which cause much difficulty when machining or polishing. Briefly, the causes are as follows: overheating the metal in any form of melting pot; if in iron pot, your alloy of 7% tin will attack the iron pot and dissolve some of the iron if overheated, and will cause inclusions of ferro aluminum; loose sand, core ends, etc., charged with the metal and run in with the aluminum in the mold or pieces of core wire, nails, etc., charged in the melting pot will cause this defect; the use of secondary metal containing iron or grindings.

However, this complaint is very common and the best method to overcome it is to carefully watch what goes into the furnace. Flux your metal with sodium or zinc chloride. Stir well and skim, and do not overheat your metal. If iron pots are used, scrape out at least once a day and do not let any metal remain in the iron pot overnight.—WILLIAM J. REARDON.

Metals and the Automobile

Abstracts of Papers on Metals and Metal Finishing Presented Before the Divisions of Industrial and Engineering Chemistry and Petroleum Chemistry at the Seventy-fourth Meeting of the American Chemical Society, September 5-10, in Detroit, Mich. (Symposium on "Chemistry's Contribution to Automotive Transportation")

Miscellaneous Non-Ferrous Metals and Alloys in Automotive Transportation. By H. W. Gillett.

The development of the automobile and aircraft industries has brought about marked changes in the alloy steel and the aluminum alloy industries. New alloys and improved methods of heat-treatment had to be developed to meet automotive needs. Nickel chromium alloys for electrical resistors, heat-resisting furnace parts and thermocouples, play a large part in the efficient heat-treatment of steel. The development of ductile tungsten that will stand up against road shocks in lamp filament, and that of zinc-base die casting alloys free from warping and corrosion are due to chemical and metallurgical research which has resulted in profoundly altering the nature of the materials. Few revolutionary changes have occurred among the other non-ferrous alloys used in automotive construction. The copper, brass, bronze and babbitt metals and alloys used in automobiles and aircraft were known and used for other purposes before the days of the automobile. Chemical and metallurgical advances in respect to copper and its alloys relate more particularly to maintenance of uniform quality and reduction of cost than to changes in the alloys themselves.

Aluminum and Its Alloys. By Francis C. Frary.

Since aluminum, unlike most common metals, cannot be produced by smelting its ores with coke, its production had to await the development of modern chemistry. The chemists and metallurgists have solved the problems involved in purifying its ores and reducing them to the metallic state, and have also developed the alloys which are used commercially, and which are of great importance in the automotive industry. On account of increasing fuel costs this industry will derive an increasing amount of benefit from the further labors of chemists in this field.

Abrasives and Grinding. By Lowell H. Milligan, Research Laboratories, Norton Company, Worcester, Mass.

It has been said that a Ford manufactured by former methods would cost as much as a Rolls Royce does now, were it not for grinding. In 1904 there was not one grinding machine in the automobile industry. Today there are 68,000. Countless parts of an automobile are finished by grinding. The chemists and metallurgists have been continually making tougher and harder steels which cannot be satisfactorily machined, but must be shaped by grinding. Abrasives are of service not alone as grinding wheels. Loose abrasives are used, suspended in grease or water, for grinding valves, for lapping piston pins and rings, crankshaft pins and bearings, and for surfacing plate glass. Glued on the surface of polishing wheels, abrasives serve to smooth and polish radiators, fenders, bumpers, and many other metal parts. Fine abrasives cemented on paper or cloth are used for various finishing operations, conspicuous among which is the smoothing and surfacing of Duco and other lacquers on automobile bodies.

Modern abrasives are artificial—the products of the electric furnace—made to specifications under scientifically controlled conditions. Their properties, as well as those of grinding wheels are continually being studied and improved. In the paper it is shown how great are the contributions of chemistry and physics to abrasives and grinding.

The Contribution of Chemistry to Electroplating in the Automobile Industry. By William Blum.

Through its demand for quantity production of plating of uniformly high quality, the automobile industry has stimulated interest in research and standardization of plating, and has thus helped to advance the plating industry.

Plating on automobiles may include applications of nickel, copper, zinc, cadmium, silver, lead, iron and chromium. The last metal is receiving much consideration for gages and wearing surfaces on account of its extreme hardness; and for exposed parts on account of its high lustre and resistance to tarnish. Chromium coatings, if porous, do not furnish the same protection against corrosion of any exposed iron as do zinc and cadmium. Chromium does, however, add to the protective value of the copper and nickel coatings over which it is usually applied.

Chemistry has given some aid and can render still more to the development of plating by (1) the analytical control of solutions and materials; (2) the specification and testing of plated products; (3) the design of plating equipment; (4) research on principles of deposition; and (5) the development of new methods of plating.

The Contribution of Chemistry to Automobile Finishes. By H. C. Mougey, General Motors Corp., Detroit, Mich.

In the field of automobile finishes, the chemist has helped in several ways:

1. By co-operation with paint and varnish makers, he has helped put the industry on a scientific basis.
2. He has produced by artificial means many of the paint and varnish raw materials which formerly were obtained from natural sources, thus increasing the supply, lowering the costs, and improving and stabilizing quality.
3. He has developed new artificial materials to replace natural materials formerly used.
4. He has developed entirely new products with new properties, to replace the old style finishes and with these new finishes, he has greatly improved durability and lowered costs.

Although the chemist has accomplished many things in the field of automobile finishes, there still remain many problems. Among them are:

1. A substitute for black baking enamel which will retain the advantages of low cost and ease of application but which will make the steel more resistant to corrosion under conditions of high humidity, and which will produce a film that holds its lustre longer on exposure.
2. Primers and surfacers for lacquer finishes, which will decrease the time of drying without increasing the cost of application.

3. Some method of obtaining the smooth surface of high lustre without the cost of the present system depending on hand rubbing and polishing.

The Surface Tension of Metals with Reference to Soldering Conditions. By A. W. Coffman with S. W. Parr, Urbana, Illinois.

An adaptation of the drop-weight method has been used for determining the surface tensions of mercury at 25° C., lead and tin and alloys of lead and tin at 350° C. in vacuum, as well as the surface tension values for some alloys, common to soldering practices in dry HCl gas at 350° C. In addition some simple spreading tests have been carried out which together with the surface tension values, made possible the establishment of a theory for the mechanism of solder spreading.

(Contribution from the Manufacturing Development Branch, Western Electric Company, Incorporated.)

The Action of Fluxes in Soft Soldering and a New Class of Fluxes for Soft Soldering. By R. S. Dean and R. V. Wilson.

It has been found that the fluxing action of the best soldering fluxes, $ZnCl_2$, $NHxCl_2$, and $SnCl_2$, depends on the evolution at soldering temperatures of HCl gas, which dry gas has been found to be an effective soldering flux. The halogens and other halogen acid gases have also been found to be effective soldering fluxes. Based on this discovery, soldering fluxes have been found among organic compounds, and the way opened for the development of a truly non-corrosive flux.

Royal Copper

Q.—Enclosed herewith you will please find an ash tray having a sort of a copper finish. I will greatly appreciate if you will write to me personally whether this finish is put on by a lacquer, enamel or a chemical process.

If this is a lacquer or enamel finish, what kind and where can it be bought or how prepared? If it is a chemical process, what chemicals were used and how deposited?

A.—The color on ash tray submitted is called Royal Copper. To produce it melt sodium nitrate—which melts at 600° Fah. By means of suitable racks immerse copper trays in molten nitrate. In the vicinity of 750° Fah.-800° Fah., the copper will be oxidized to red copper oxide. Remove and allow to cool in air. When cool, immerse in hot water to dissolve off salts; dry; and buff lightly with red rouge. Before articles are immersed in molten nitrate, they must be highly colored, cleaned and dried in order to obtain a clear coloration.—Joseph Haas.

Covering Rust

Q.—The writer has a number of bumpers and radiators to replate.

After they are polished there are some deep rust spots and I would like to know if, after they are polished and given a coat of nickel, then a heavy coat of copper from an acid copper solution, then another coat of nickel, will that cover the deep rust spots? Have you any other suggestion to make which would be better and that would cover these deep rust spots?

A.—Plating will not fill up any holes in the metal that one desires to plate. In the end it pays to polish the holes out if there is enough metal to polish upon. If the metal is too thin, then the holes have to be left.—Joseph Haas.

Black on Brass

Q.—For some time, the writer has been using a solution of sugar of lead and hyposulphate of soda at 160 degrees Fahrenheit. Accordingly, a fine steel blue is the result, but have tried without success to get black. Recently I tried carbonate of copper and ammonia, but the color obtained was not uniform.

Information is respectfully requested as to what process and with what chemicals, can a durable black color be obtained on small yellow brass shells, the finish not to require laquering.

A.—The ammonia black is the only method that will produce a satisfactory black on bulk articles, in our opinion. Perhaps method of operation was faulty. Try the following:

Copper carbonate	16 ozs.
Sodium carbonate	8 ozs.
Water	2 gallons
Ammonia	1 quart

Have standing in a tank of hot water at 180° Fah. Ammonia should be added each time the dip is used after being idle for a period.—Joseph Haas.

Cleaning Brass Parts

Q.—We make more or less brass screw machine parts and have heretofore removed the oil, etc., after they come from the machine by dipping them in gasoline or coal oil.

While this is effective, it is hazardous and otherwise unsatisfactory. We should like to know how to give this work a bright dip. We are equipped to clean these parts in a soda kettle; this however discolors the parts and a subsequent dip would be necessary to restore them to a bright color and make the parts uniform in appearance. We note that product from other manufacturers in our line is delivered in this manner, and we should like to follow a similar process.

A.—The most efficient method of cleaning screw machine products, involving no acid bright dipping solution is to tumble them with sawdust. After the goods have tumbled in sawdust 15-20 minutes, the sawdust is screened out of the horizontal tumbling barrel, by substituting a screen in place of the cover and allowing the barrel to revolve until sawdust is screened out. This does not take more than 5 minutes, after which the articles are dumped out clean and bright.—Joseph Haas.

Filler for Die Castings

Q.—We manufacture zinc die castings and when they come out of the die they have a great many shallow holes and hollows. This makes it necessary to plug the holes with solder. Please suggest to us some metal filling so that we can do away with solder. These castings must be sand blasted and then enameled and the filling must be hard enough to resist the blasting.

A.—We are very sorry we do not know of any metal filling that can be used to fill up holes in zinc base die castings that will stand sand blasting. The better way would be to try and eliminate the shallow holes. If not, solder appears to our mind to be the most satisfactory.—William J. Reardon.

Antique Finishes on Copper and Brass

A Detailed Description of the Methods and Formulae Involved

Written for the Metal Industry by N. RICHARD

The bright shiny finish of copper and brass, while highly attractive in itself, is not always desirable in certain applications or in making repairs. Brass door knobs, hinges or locks while beautiful in themselves with their glistening finish, may not at all harmonize with a dark, finely grained and soft finished door or paneled woodwork. Replacing a single piece of brass or copper hardware in a unit requires that the new piece of hardware be brought to the same finish as the original pieces remaining, or the effect is lost. On both the exterior or interior of the house, copper in its normal bright finish is not desirable, particularly in old houses. There are many little odd brass or copper ornaments, accessories or fixtures, which would increase their beauty many fold, if they can be brought into harmony with their surroundings. To produce these varying finishes is not difficult, nor does it require any special equipment, and is certainly worthy of the effect.

Copper

Cleaning. Before cleaning, it is essential that the metal be freed of oil that was used in the rolling operations. Due to the fine grain structure of the metal, the oil or grease has been rolled into the pores and cleaning should be carried out carefully. Prepare a strong soda or potash lye solution by adding about a pound of lye to a pail of boiling water. Dip the metal or apply the solution with a brush, scrubbing it well. Then rinse or wash the metal with plain hot water and finally with cold water.

Coloring. Copper when exposed to the atmosphere will develop verdigris (green) after a time, due to natural phenomena, especially along the sea coast. To quickly develop this beautiful green effect that is so striking and permanent, one of the following methods may be used:

(1) Use a solution of one half pound of salt to two gallons of water.

(2) Dissolve thoroughly one pound of powdered sal ammoniac in about five gallons of water, and let it stand for a day.

Apply either solution to the copper with a brush covering evenly every part. Let the copper stand for a day, and then sprinkle the surface with clear water.

Brown-Reddish-Bronze-Blue-Black Tones in Copper. If a dark copper or brown tone is desired on copper exposed to the atmosphere, it can be obtained by rubbing the copper with cotton waste soaked in linseed oil. This coating will gradually turn the copper a dark brown and will adhere to the copper surface for a long time. Another method more suitable for small articles is to thoroughly clean the surface and then use a solution of:

Water, 100° F.	1 gallon
Sulphuret of potassium or polysulphide	¼ to ½ oz.
Ammonia water 26%	10 drops

(This solution may be purchased made up.)

Tones develop on copper in the following order—brownish, reddish-bronze, bluish-black, and black. Remove the copper articles when the desired tone is reached, and wash thoroughly.

Scouring with pumice and water or oil helps to bring out certain tones. Scratch brushing with a brass wire scratch brush is another means of developing additional tones.

Antique Green Oxidizing Effect. After cleansing, use the following solution.

Hot water 160° F.	3 quarts
Muriatic Acid	1 quart
Verdigris powder	3 pounds
Copper carbonate	8 ounces
White powdered arsenic	8 ounces
Sal Ammoniac	3 pounds

Apply this lightly to the copper. Atmosphere will deepen the green color.

Brass

Hardware Green Finish. Produce a fine emery finish, clean thoroughly and immerse in the following solution until the brass develops a greenish color:

Water 180° F.	1 gallon
Hyposulphite of soda	8 ounces
Nitrate of iron	2 ounces

When the green tone develops, wash the brass in water and if desirable, touch up the bright lights with a brush or wheel and a little fine brimstone and water.

Blue or Black on Brass. Blue or black is obtained, depending upon the time the articles are immersed, when using the following solution on cleaned brass:

Water, 180° F.	1 gallon
Lead Acetate	2 to 4 ounces
Hyposulphite of soda	8 ounces

If black only is desired, use the following solution after thoroughly mixing:

Dissolve copper and carbonate	8 ounces
In ammonia water 26%	1 pint
Add to water, 120° F.	1 gallon
Add sal soda crystal	4 ounces

Blackening Brass. 68 parts of ammonia (specific gravity 0.91.) Add 10 parts of basic copper carbonate, and shake or stir frequently. After 24 hours some basic carbonate should remain in the solution. If not, add more and shake and stir. If some basic carbonate remains undissolved, add 25 parts of water. After mixing thoroughly the solution is ready to use, by immersing the brass articles.

Acid Green

Q.—Please send me the formula for acid green on bronze cemetery plates; also acid green on brass.

A.—Use the following on either bronze or brass.

Water	1 gallon
Hydrochloric acid	1 qt.
Acetate of copper	1 lb.
Copper carbonate	½ lb.
White arsenic	½ lb.
Sal-ammoniac	1 lb.

Add the chemicals very carefully and slowly. Then heat to a boil; allow to settle and pour off clear liquid. Use only the clear liquid. The green is applied with brush by stippling. If used on the clear metal a light green will result. By oxidizing the bronze or copper, dark green will result. By oxidizing the bronze or copper, dark green is obtained. Steel cannot be plated directly in an acid copper solution.—JOSEPH HAAS.

Racking Kitchen Products

How Kitchen Utensils Are Hung for Plating

Written for The Metal Industry by WILLIAM E. BELKE, President Belke Manufacturing Company, Chicago, Ill.

One reader of this series of articles on racking, which is being published in the Metal Industry, has anticipated our intentions. To date we have only described the proper method of rack construction for copper, nickel, silver, and other solutions which require the conventional brass spine rack, and it was our plan to go into the details of chromium plating towards the end of this series.

However, a very interesting inquiry has come from Canada, which we feel may serve to provide some valuable information. I am quoting the letter herewith, and my recommendations follow:

The letter is from P. W. Blair, Mechanical Editor of THE METAL INDUSTRY, who runs a plant in Port Hope, Ontario, Canada. He says:

"At the request of the plater here I had some plating racks made up with a two point pressure contact, same as you illustrate in your article of METAL INDUSTRY, May Issue." (Note: This explained the benefits of using an angular cathode hook instead of a round hook. I described how a round cathode hook gave only one contact on to the bar, and this contact may be severed by dust. By making an angular cathode hook, with an inverted "V" shape on the inside, two sides of the hook rest on the bar and consequently there are two contacts. A thumb screw secures the contact.)

"The rack was made from ⅜ iron pipe size brass pipe, wire hooks screwing in brass pipe and nut. We found when the hook broke off, the nut was corroded on hook with nickel deposit and it was hard to detach. Would you suggest using ⅜ iron pipe in place of brass pipe, also iron hooks and nuts, and coating same with asphaltum? Would this be a prevention of the deposit forming on rack and hooks? Also, would it help to place a cap on the end of the pipe? Also inform me what effect iron racks would have on chromium plating, as we are figuring on equipment for chromium installation in the near future. Would we still use brass hooks cast and threaded to fit pipe?"

This plater's difficulty, as far as removable tips are concerned, was that he failed to place a fiber washer between the nut and spine. We advise him to do this, and there will be no further trouble.

Regarding the use of iron or brass in chromium plating, I strongly recommend iron for the rack construction, as it is not as soluble as other metals in this solution. However, when the rack is rubber covered, this is not so necessary, as the rack is not exposed to the solution.

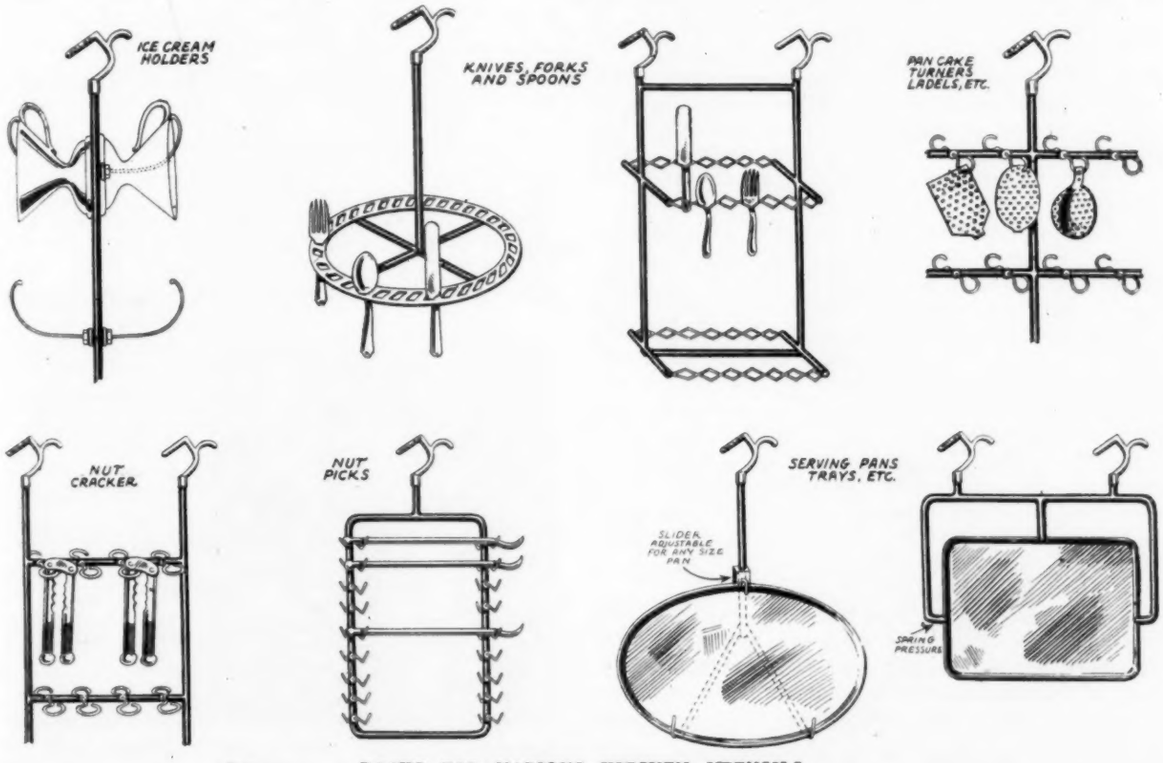
Solid metal is much better than tubing, as tubing will carry more current, and good chromium plating is entirely dependent on the current carrying capacity of the racks.

I plan to go into the matter of chromium plating much more thoroughly in the near future, but I felt that these suggestions to Mr. Blair may prove helpful to other platers.

The object of this article was to go into detailed description of racking kitchen products.

The drawings which are shown in this article describe (No. 1) an ice cream holder, which requires a tip rather long, and of thin, springy metal. The tip should only be as long as the depth of the ice cream holder, and the end should not curl over farther than to merely assure a good hold.

Perhaps the most unique of racks are those used for plating knives, forks and spoons. This is rather delicate



RACKS FOR VARIOUS KITCHEN UTENSILS

work, and as every part of the surface is plated, a clumsy support would only cause flaws.

Figures 2 and 3 show the two types which are most useful. The first consists of a regulation ⅜ inch brass spine, rubber covered, with screwed-in cathode hook. At the bottom of the spine are four arms, which hold the circular metal holder. This metal circle is detachable from the rack, so that it may be taken off and replaced when it is coated with silver. The coated circle may be strung from the anode bar and used as an anode until surplus metal is taken off.

Figure 3 shows a regular two-spine rack, with four arms, each holding an end of the wire support for the silverware. The four arms have a bare tip at the ends, and ordinary wire is strung from one tip to the other, and bent, as shown, so that knives, forks, and spoons may be inserted. This wire is easily detachable, and also may be strung up on the anode hook until its silver is used.

Figure 4 shows a four-arm rack with tips bent into a two-thirds circle. Pan cake turners, ladles, and other small and perforated articles be strung in so that they will not fall off.

Figure 5 is self-explanatory, in describing the proper way to rack nut crackers, as is figure 6, for nut picks.

Figure 6 shows a rack for serving pans, trays, and such, which requires careful construction. The rubber-covered spine has two legs, stretching at an angle, so that the tips will catch the bottom of the tray just at the edge.

In the center is an adjustable slider, which permits one to rack various sizes of trays. This is a very efficient rack.

Figure 7, also for serving trays, pans, and such, of the square or rectangular type, is not so easily adaptable to different size trays. Spring pressure from the two outside arms holds the tray against the upper arm, in the center. At the ends of each arm are slotted tips, which may be replaced.

Protective Clothing for the Foundry Worker*

Protective clothing is not a substitute for good housekeeping, for safeguarding or for safety instruction. It is, however, a vital precaution against the consequences of a misstep and nowhere is it needed more than in the foundry where molten metal and other hot substances must be handled.

The protective garments required by foundry workers (starting from the ground up) are: foundry shoes, leggings, gloves and goggles.

Foundry shoes must protect the feet against both splashes of molten metal and falling objects. Shoes of the type known to the past generation as the "Congress gaiter" prevent molten metal from reaching the flesh. They can be removed quickly without unlacing. The specially made foundry shoe is treated to resist molten metal, heat and water, and is provided with a reinforced toe. Where the hazard of dropping heavy objects on the toes is particularly serious metal protectors which can be buckled on over the shoes are sometimes used.

Asbestos leggings, because of their heat resisting qualities, are desirable in foundries. Other types of leggings are made of leather or canvas. Chrome leather leggings are serviceable, also expensive, but other kinds of leather have not proved satisfactory in resisting molten metal and hot cinders.

Canvas leggings are lower in cost and if well-made and fire-proofed will give satisfactory service. Leggings used for protection against heat should be quickly removable and should have no projecting clasps or straps. These offer a place for molten metal to lodge upon and burn through to the flesh and also make it difficult to remove the legging quickly when an accident occurs. When provided by the company, leggings should be carried in varying sizes to fit various sizes of legs snugly at the top.

Judging from the photographs of foundry scenes received by the National Safety Council the use of gloves and hand leathers is not universal. In pouring the necessity for their use is, perhaps, debatable but in handling hot objects or those with sharp edges there can be no argument as to their importance.

Usually there is comparatively little difficulty in getting foundry workers to wear safe shoes and leggings. Goggles, however, are a different story. The most common objection is that the goggles fog quickly but persistent education will usually make the workmen see the slightness of the inconvenience and the seriousness of the hazard. If persuasion fails, discipline may be more effective.

Rolls of toilet paper in convenient locations will be found useful for cleaning goggle lenses. The worker's handkerchief is seldom in a satisfactory condition for this purpose.

On some foundries it is a regular practice to require the workmen to line up for inspection before starting to handle the molten metal to make sure that they are equipped with the necessary protective clothing.

It is not unusual in some foundries to see workers more or less protected against splashes of metal while a foreman equally exposed is standing by with no protection whatever. The supervisor should take all the precautions required of his men, not only for his personal protection but also to back his orders more strongly with a good example.

* From the National Safety News, of the National Safety Council, Chicago, Ill.

Roosevelt Memorial Bird Fountain

A pretty example of outdoor bronze statuary is the Roosevelt Memorial Bird Fountain erected in the Roosevelt Bird Sanctuary at Oyster Bay, L. I., N. Y., by the National Association of Audubon Societies. The work represents a figure holding a basin of water, while seated on the rocks is a little boy holding a bird. Nearby is another bird and a squirrel. The statuary was placed in position in May, 1927, and was cast by the Roman Bronze Works of Brooklyn, N. Y. Mrs. Bessie Potter Vonnoh was the sculptor.

BRONZE STATUARY FOR ROOSEVELT MEMORIAL

The Roosevelt Bird Sanctuary adjoins the cemetery where Theodore Roosevelt is buried and is reserved entirely for bird life. The haven is provided with bird houses, feeding stations and an ornithologist. Dr. Swope is in constant attendance.

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With Which Are Incorporated

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THE METAL INDUSTRY, 99 JOHN STREET, NEW YORK
Telephone Number: Beekman 0404. Cable Address: Metalustry

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EDITORIAL

PATENTS AND ROYALTIES

Undoubtedly the greatest single aid to invention in the United States is the protection afforded by our patent laws. Without such safeguards few would dare to go to the labor and expense of developing new products and methods, as these developments could be taken from them and used by others, leaving the inventor high and dry. Perhaps the patents laws are not perfect; perhaps it is possible to obtain patents which do not hold; perhaps a patent is only a license to a law suit. Nevertheless, patents do give protection and have been the making of more industries than we have space to name.

Yet, strangely enough, the procedure in obtaining rewards for patents is still unsettled. In the mining or oil industries patents are sold on a royalty basis and the customs are such that there is no difficulty in obtaining royalties for valuable processes. In the foundry and electroplating trades on the other hand, for some reason or other, it is extremely difficult to apply such methods. Improved equipment can be sold and if it is a great improvement, the price can be made such as to reward the inventor adequately. Processes, however, are in a different class and are much harder to protect. The present controversy about the rights and wrongs of the patents on chromium and cadmium plating is a clear case in point.

We have a peculiar situation. Certain companies have developed new processes for depositing metals which, heretofore, were not deposited on a commercial scale. They have gone to great expense, built laboratories and plants, developed methods and controls and have accumulated a vast fund of information. Consequently they wish to capitalize these expenditures, as they are not government bureaus and must show profits to continue in business. What is the right method for them to obtain legitimate profits from the electro-plating industry? Is it by the sale of chemicals and equipment? Is it by charging a fee for installation and operation of plants? Or is it by obtaining royalties on the work turned out by their methods?

These questions which have resulted in heated and sometimes acrimonious debates have been clouded by an aspect which does not belong there. Certain things have been called "right" or "wrong" as the case may have been. As a matter of fact, in principle, there is no question of right or wrong in this case. Those who have done constructive work should be rewarded therefor, and this has never been denied. Those who have, through such work, obtained sound patents should be paid for their efforts. This is also undeniable. The only question that remains is, how shall they be paid? Any method of fair payment is right. The only things that are wrong are inadequate payment or excessive payment and that is something which can be left to the business judgment and fairness of all sides involved. A fair reward by any of the three methods stated above would be right. The only question is, which can be operated most successfully in the plating industry?

It may be said that regardless of its customs, the license and royalty plan is fair and should be put into action. This may be theoretically correct, but from a business standpoint it may have such difficulties that it will not obtain the desired results. On the other hand some progressive and prosperous firms may see the value of paying a license fee and a royalty on their products rather than to spend the large sums necessary for research to acquire information which is already in existence.

We must repeat, therefore, that it is not a question of rights and wrongs so far as the patents are concerned. If it comes to the courts, they will decide what patents are valid, and no amount of outside discussion will have any effect on this situation. Granting, however, for the moment, that certain patents are valid, the only point to consider is how to apply these patents most successfully, obtaining a fair return for the inventive ability, the work done and the investment made.

It is possible that this will be worked out, perhaps not by one set method, but by a flexible plan, applicable in different ways in different places. Perhaps a set of alternatives might be drawn up leaving the choice to the user of the process under these patents.

Nothing can be more certain than the fact that there is no gain to any side in heated and unwarranted attacks. The matter is altogether one of business, and business matters can be settled by business men without coming to blows. Whatever legal measures may be taken, should, we believe, be in the form of measures to clarify the situation and settle it once for all. From then on companies will know just what they may or may not do, and what will pay them best to do.

ALLOY PRICE QUOTATIONS

A matter is receiving the consideration of the Executive Committee of the American Society for Testing Materials which will interest every manufacturer and user of ingot metals. G. H. Clamer, president of the Ajax Metal Company of Philadelphia, in a recent article in the Daily Metal Trade called attention to the inadequate method of describing metals in giving market quotations, laying particular stress upon the absence of accurate designation of quality upon which the quotations are based. For example, the price of 85-5-5-5 mixture may vary ⅛ cent from one day to another, but this difference is of no consequence in the comparison to the difference between varying qualities of 85-5-5-5, the amount of new metal used, the latitude permitted in impurities, etc.

Mr. Clamer suggested that quotations be based on known specifications. The mixture 85-5-5-5 could be based on A.S.T.M. Specifications for bronze bearing metal (B 31-21). Similarly the alloy 80-10-2 would be referred to as A.S.T.M. Specification B 10-18. This would give the purchaser a definite guarantee of quality and allow him to make intelligent comparisons.

Realizing the need for concerted action by bodies with authority, Committee B 2 of American Society for Testing Materials has passed a resolution recommending:

1. An investigation of the whole subject.
2. If upon investigation the matter is of the importance that Committee B-2 believes it to be, that a committee be organized.
3. The function of the committee should be to study the possibility of using, insofar as is possible, the A. S. T. M. specifications and nomenclature in describing the metals or alloys quoted upon.
4. Should it be found that the same conditions exist in quoting on ferrous and other materials of engineering, that the committee be sufficiently broadened to act intelligently on materials other than non-ferrous materials.
5. Should the Executive Committee decide to organize a committee as suggested, that trade paper representatives be included.

The value of this project is so obvious that it needs no further recommendation. Not only should quotations for metals be standardized but quotations for all engineering materials, and this undertaking could be in no better hands than the A.S.T.M. The inevitable result of such a campaign, aided by the technical and trade journals, would be the education of purchasers in the value of specifications and it would have a great stabilizing effect on the metal manufacturing industry.

CO-OPERATIVE WORK

The efforts of trade organizations in various lines to work for the benefit of their industries, in some cases with more success than others, makes very interesting reading of a report of the Artistic Lighting Equipment Association for the 12 months since that organization approved a new plant of operation and gave authority to carry on this work. In June 1926, the A.L.E.A. had fewer than 41 members in good standing and was several thousand dollars in debt. Now, the membership has risen to 128. The organization has developed a concrete, workable four-year program of activity. It has adopted a Code of Ethics and Fair Trade Practice, and secured a fair acceptance of their use. A successful lighting equipment exhibition has been held with the largest dealer attendance ever secured.

They have held a practical cost conference where an actual test took place, indicating the necessity for a better knowledge of manufacturing costs throughout the industry. This work has been followed up by the Cost Committee who have developed an official uniform cost formula, approved by the Board of Directors and it is now ready for distribution and use.

The managing director of the association is now handling a number of cases in dispute, to be decided by arbitration. A collection department functions, free of charge for members, and has collected over $35,000. A publicity department is doing active and constructive work. An employment exchange helps to keep good workers within the industry. Special meetings and conferences of special groups have been held to give service to the different smaller groups of the industry in dealing with their specific problems.

The Association is co-operating with the United States Government in the handling of cases respecting tariffs, and with the Department of Commerce in securing an intelligent census of the lighting equipment industry. A traffic bureau has been established and co-operative work is being carried on with other associations in the electrical field. A co-operative sales promotion campaign is in project and will be undertaken soon.

There is no need to go on at length to list all of the tasks which a trade association can perform for its members. Industry needs co-operative effort, intelligently applied, and there is no industry which does not have its serious problems. We point out the Artistic Lighting Equipment Association as an example of what energetic and intelligent effort can do for a trade.

METAL MANUFACTURERS IN NEW YORK

To those who live in New York, it is a city of offices, stores and apartments on Manhattan Island with homes in Brooklyn and the Bronx and farms on Staten Island. To the outsider who comes to visit New York, and does not get outside of the Borough of Manhattan, it is a city of offices and stores by day and bright lights by night. It is surprising therefore, to find, from an analysis of the 1925 census of manufactures obtained by the Merchants Association of New York, that there is manufactured in Greater New York City more clothing, millinery, lace goods, furs and fur goods, feathers and plumes, artificial flowers and plants, pocketbooks, purses and card cases, tobacco pipes and cigar and cigarette holders, than all of the rest of the country combined; also lapidary work, hair work, music printing and publishing.

In the metal trades, New York ranks high. In dental goods, 33 per cent of the total U. S. production is made in New York; over 25 per cent of the toys, games and playground equipment much of which is made of metals; over 25 per cent of the mirrors (which are of course, silvered); over 25 per cent of the stereotyping and electro-plating; over 25 per cent of the statuary and art goods; 22.6 per cent of the gas machines and gas and water meters; 20 per cent of the gold and silver leaf and foil; 16.8 per cent of the scientific instruments.

It will be clear from the above figures that New York is a very important manufacturing center, but it is mainly restricted to work of the type which can be done in comparatively small quarters. Long Island City (Queens Borough) has grown to be an important manufacturing neighborhood, but Manhattan and Brooklyn have thousands of factories, housed in loft buildings, making small products but in enormous quantities.

The trend of manufacture of heavy materials is probably away from New York City proper. Light materials and small products, however, still seem to be holding their own as the importance of being near the market overbalances other considerations.

HARDENED COPPER

It takes a long time to lay some ghosts and one of the most persistent is the ghost of hardened copper. According to the Copper and Brass Research Association thousands of dollars are spent every year in an effort to rediscover this supposedly forgotten formula in spite of the fact that we now know not only how the ancients hardened their copper and bronze but also how to produce such products even harder than theirs. By means of cold work or the addition of some other metal or metals, copper can be hardened without difficulty. This leaves out of consideration of course, the spurious hardened copper made by inclusion of oxides which merely injure it.

A recent development has, however, opened up some new possibilities. M. G. Corson described at the February, 1927, meeting of the Institute of Metals Division, some new systems of copper made by the use, mainly, of silicon, in conjunction with nickel, cobalt, or chromium. These alloys have the property of being hardenable by heat treatment, thus falling into the class of alloys which can be tempered. High strength and a relatively high conductivity are obtained, but the conductivity is much lower than that of pure copper. These alloys seem to have fields of usefulness.

The discovery of a method of hardening copper in such a way as to retain its high conductivity and increase the tensile strength materially would be really worth while. In the meantime the best advice to untrained searchers and discoverers of hardened copper is to leave it alone.

PRIZES FOR FOUNDRY PAPERS

Announcement is made by the American Foundrymen's Association of the authorization of three prizes, $100 each, for papers presented at the 1928 Convention on various phases of foundry practice, among which is that of non-ferrous metals. The Board of Awards will arrange for the judging and selection of papers.

We are publishing this announcemnt to advise our readers sufficiently ahead of time in order that they may, if they wish, direct their efforts, toward this prize. Of course, the monetary consideration will form only a small part of the value of a technical paper to its author. His gain in reputation and standing can be valued far beyond any immediate financial reward, and the "long pull" returns for such work are often great. Immediate recognition, however, whether it be in the form of a medal, certificate or cash, injects a competitive element which acts as an incentive.

CORRESPONDENCE and DISCUSSION

Although we cordially invite criticisms and expressions of opinion in these columns, THE METAL INDUSTRY assumes no responsibility for statements made therein.

BAKING JAPAN

To the Editor of THE METAL INDUSTRY:

In your September issue, page 378—article "High Lights on Japanning"—the author makes the statement that with japans the oil is burned out and nothing remains on the surface but Gilsonite.

If the author's contention is true why bother with the oil? Gilsonite is soluble in benzine and it would seem only necessary to make that solution, put it on the surface, let the benzine go off in the air, and lo and behold—you have a wonderful coating of Gilsonite!

Both the Gilsonite and the oil remain behind.

Simple tests would show that if the temperature ever gets up to the point where the oil begins to burn out the Gilsonite will burn out also. Just try baking japan on a piece of metal in a heat treating furnace and slowly raise the temperature up to 1000° or 1500° F.

Hilo Varnish Corporation,
Carl J. Schumann, Secretary.

Brooklyn, N. Y.
September 19, 1927.

HEAT TREATING TOOLS

To the Editor of THE METAL INDUSTRY:

While reading the article headed "Taps for Brass" in the September issue of THE METAL INDUSTRY, I recalled a method of hardening high-speed steel tools which I would like to have you bring to the attention of your readers.

To eliminate the rough surface due to heat treating high-speed steel, the furnace should be heated to a white heat before preheating the tools. The tools can be pre-heated in the front of the furnace, near the door and out of the blast. When they are pre-heated to a cherry red they should be moved to the blast and brought to a white heat very quickly, then quenched in oil. They should then be tempered to suit the condition for which the tool is to be used, generally to about 600 degrees Fah. The essential part of the process is to bring the steel to a white heat very quickly.

LOUIS J. FITZSIMMONS,
Supervisor of Tools,
Isemann Magneto Corp.

Brooklyn, N. Y.
September 26, 1927.

NEW BOOKS

Chemical Engineering Catalog. Published by the Chemical Catalog Company, New York. Size 8½x11½, 1,160 pages. Price $10.00, except to those engaged in chemical or allied industries, to whom the price is $3.00.

This is the 12th annual edition of a catalog which has long been standard in the chemical industries. It includes data of equipment, machinery, laboratory supplies, heavy and fine chemicals and raw materials used in industries employing chemical process of manufacture. In addition there is a technical and scientific book section, cataloging and briefly describing a long list of books in English on chemical and related subjects.

The catalog is the result of collaboration between publishers and three major chemical societies and includes on its editorial and advisory boards, a number of foremost figures in American chemistry.

GOVERNMENT PUBLICATIONS

Health Hazards of Brass Foundries. By John Arthur Turner and L. R. Thompson. Public Health Bulletin No. 157. United States Public Health Service, Washington, D. C.

This bulletin includes field investigations of the health hazards of the brass foundry industry, and laboratory studies relating to the pathology of brass foundrymen's ague. It is obtainable from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 20 cents per copy.

Alphabetical Index and Numerical List of United States Government Master Specifications. Promulgated by the Federal Specifications Board. Circular of the Bureau of Standards, No. 319, Washington, D. C.

COPPER IN TELEPHONE SYSTEM

170,000,000 pounds of paper, lead and copper are used yearly in one plant alone to produce telephone cable required for the Bell Telephone System.

This cable is manufactured in two plants—one at Kearney, New Jersey, and the other at Hawthorne, Illinois. Cable stranding machines at the Hawthorne plant have a capacity of 590 reels of wire and produce over 50 linear feet of cable per minute. To insulate the wires in the cable requires 6,000 tons of paper of twenty-three sizes and five different colors.

TECHNICAL PAPERS

The Prerequisities of Successful Polishing. By Bradford H. Divine, president of Divine Brothers Company of Utica, N. Y. This paper was presented at the First National Meeting of the American Society of Mechanical Engineers, Machine Shop Practice Division at New Haven, Conn., September 6-9, 1927.

The author discusses those conditions which must be obtained in the polishing department to procure the highest quality of work with the least cost of material and wages. The most important consideration in successful polishing is the glue used in bonding the abrasive to the wheel and its treatment.

The next most important consideration is the selection of the abrasive. These are discussed in detail. Other important factors are: the design of the article to be polished, relation of operations preceding polishing, absence of vibration, housing of the polishing department, polishing machines, automatic polishing, and polishing tools.

Anodes for Chromium Plating. By Oliver P. Watts. A paper presented at the Fifty-second General Meeting of the American Electro-chemical Society, on its Northwestern Trip, Sept. 4-21, 1927.

If these experiments are taken at their face value they indicate that of all materials tested lead is the only one that should be used as anode in chromic acid solutions for long-continued operation.

An exception to that conclusion may, however, have to be made in the case of iron or steel, for the reason pointed out under that topic. Iron-silicon alloys are at least the equal of, and on further test may prove superior to, pure iron or steel as anodes.

ACCIDENT PREVENTION COURSE

In response to the increasing demand for trained leaders in safety work, the first collegiate course in accident prevention was given last year at New York University, New York, under the direction of the Extension Division in co-operation with the American Museum of Safety of New York City. The course opened last October with an enrollment of 55 persons.

This course for the training of safety engineers and public safety directors began its second year on Monday, October 3, when the first two-hour class session will be held.

SHOP PROBLEMS

THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ASSOCIATE EDITORS { JESSE L. JONES, Metallurgical; WILLIAM J. PETTIS, Rolling Mill; W. J. REARDON, Foundry; W. L. ABATE, Brass Finishing; CHARLES H. PROCTOR, Plating Chemical; P. W. BLAIR, Mechanical }

BRIGHT COPPER

Q.—We are doing a large number of steel radio panels size about 18 x 30. These are copper flashed and then the front is painted black; no buffing at all. We are using cyanide solution hot, and bisulphite of soda. How can we get a bright flash that will hold without spotting and changing color; also spotting wherever the plates are touched by the hands? After being removed from the bath and rinsed in cold water, we tried dipping into cyanide then drying.

A.—You must realize that the brighter the copper plated deposit the more susceptible it is to oxidation, due to the sulphides in the atmosphere. This is the reason why copper plated surfaces must be lacquered to prevent such oxidation. Finger marks, etch and stain copper plated deposits. If you cannot lacquer the copper, for reasons best known to yourself, it is advisable to wipe down the copper plated surface with a cloth moistened with a little olive oil or Johnson's furniture brightener. Either of these materials will give you the protection necessary. The addition of 1 oz. hyposulphite of soda to each 100 gallons of copper solution will give a brighter copper. Keep sufficient free cyanide in the solution, wash the plated deposits thoroughly in cold and boiling water, add ⅛-oz. phosphoric acid per gallon of boiling water when rinsing.—C. H. P. Problem 3,682.

CHROMIUM ON STEEL

Q.—What is the best way to rig up a two-throw switch, and the advantage?

What is the best method to clean steel dies for chromium plating?

Is it necessary to nickel plate steel dies before chromium plating, and what nickel formula should be used?

A.—The double throw switch in connection with electro cleansing should be so arranged that the positive and negative currents are connected at the bottom of the throw for direct current. On the reverse or top throw, the connections should be negative as opposed to the lower positive and positive as opposed to the lower negative; the non-conductive throw handle atcing as the insulator between the currents. The direct current, however, is almost universally used.

Steel dies for chromium plating should be pickled free from scale in pickling solutions consisting of equal proportions of muriatic acid and water, heated to 140-160 deg. F., or water, 1 gallon; sulphuric acid, 12 to 16 ozs.; common salt, 2 ozs.; tin chloride, ½-oz.

After they should be washed, electro-cleansed, then brushed down with a plastic mixture prepared from equal proportions of powdered hydrate of lime and finely powdered pumice stone. Mix to a plastic mass with sodium cyanide and water. Water, 1 gallon; sodium cyanide, 8 ozs. The final brushing with this mixture, the moment before plating, will always assure a chemically clean surface. Wash quickly in water and plate steel direct in the chromium solution. It is not necessary to previously plate the steel with copper or pickel.

One of the best formulae for chromium plating steel is as follows: Water, 1 gallon; chromic acid (99% chromium, 04% sodium bisulphate), 20 ozs.; chromate of iron, 1 oz.; chromic sulphate, 1 oz.; boracic acid, ¾ ozs. Voltage 6-9; anodes, sheet steel; temperature 110-120° F., amperage 125 minimum per sq. ft. of surface area.

In preparing this solution, dissolve the chromic acid in ⅓ the water at 200° F., then add the chromate of iron with constant stirring, then the chromic sulphate and boracic acid. Add the balance of the water cold, to the normal temperature required. Round articles should be surrounded by an anode of steel several inches larger in diameter than the article to be plated. For plating articles with deep depressions, arrange internal anodes to conform to the shape of the depression from sheet lead attached to a steel hook or steel contact plate.—C. H. P. Problem 3,683.

CONTROLLING SOLUTIONS

Q.—I would like information on the cleansing of anode bars, bus bars and nickel solutions; just when it is necessary to clean the anodes and how one may tell the time. This also applies to bus bars and nickel solutions. I am wondering if there is a time element that enters into this.

Secondly, I would like to know whether it is more advisable to test chrome plating solutions by conductivity or by titrating the solution. If our plate shows weak, is it advisable to add more chromic acid or what should be done. In fact, I would appreciate having all the information you can give pertaining to chrome plating, testing chrome plating solutions and their analysis.

A.—An efficient plater or supervisor will always keep every part of his electrical conductors clean and bright. This includes anode and cathode rods and bus bars. When once cleaned bright, then whenever possible, a coat of spar varnish should be applied, then cut through to make a good contact. Naturally, the cathode bars or rods cannot be so coated.

Nickel solutions should be filtered continuously or at intervals to remove insoluble material. If nickel anodes are made up, either cast or rolled, 99% plus, dead soft, there will be no necessity for cleansing them. Lower percentage anodes should have the graphite carbon removed at intervals of a few weeks so that the metallic nickel is exposed.

Chromium solutions can be tested by titration although conductivity is a deciding factor. Many firms that are chromium plating merely test with the Baumé hydrometer. The density of the solution should be known when first prepared, then maintained at the same density by additions of chromic acid; the water line should always be maintained constant. If the chromium deposit perceptibly burns or whitens a dull white or gray, then the acidity should be reduced with chromic carbonate, or chromate of iron additions of ¼ to ½ oz. of either material will be ample. The same voltage and amperage should always be carried upon a known surface area, the exact temperature; also 115 deg. F. plus or minus 5 degrees. Write to Dr. Blum, Bureau of Standards, Washington, D. C., for the Government Bureau of Engraving and Printing methods of analysis of their chromium solutions.—C. H. P. Problem 3,684.

COPPER ON LEATHER

Q.—We would like to know whether you could give us some information on leather plating, finish to be in copper.

A.—Leather can be coated with copper by aid of the following methods. The leather should be sprayed with a mixture of gun cotton lacquer and finely divided copper bronze powder in the proportion of 1 to 1½ pounds copper bronze to one gallon of lacquer. When the copper bronze surface so applied to the leather is dry and hard it can be copper plated direct under usual conditions of copper plating with acid copper solutions. The usual solution for copper plating consists of water, 1 gallon; copper sulphate, 1¾ pounds; sulphuric acid, 4 to 8 ozs.; yellow dextrine, ⅛ oz. Temperature, normal; voltage 1½ to 2; anodes soft sheet copper as may be required.—C. H. P. Problem 3,685.

CRACKING NICKEL

Q.—We experience more or less trouble nickel plating stereotype plates. Our method is as follows. After casting plate we scrub with a strong lye solution, adding a little pumice stone when plate is finished. After going through beveling and trimming machines the edges of plate present a ragged appearance due to nickel coming off. What is the best method to clean the plates?

A.—We believe your trouble is due primarily to the nickel solution you are now using which results in a brittle nickel de-

posit. To prove this, instead of cleansing the plates as you now do by brushing down with pumice stone only, use the following combination. Fine powdered pumice stone or silica, 1 pound or more; hydrated lime, 1 pound or more; water (temp. 160° F.), 1 pint; sodium cyanide, 2 ozs. Dissolve the sodium cyanide in the hot water, then mix with the pumice stone and lime until a stiff paste results. Use this mixture to brush down the plates. If after, the nickel is still brittle, then the trouble lies in the solution and is due to hydrogen deposition with the nickel. To overcome this, purchase several bottles of hydrogen peroxide, then add ¼-oz. per gallon of solution, a little more may be necessary. Stir thoroughly into solution preferably at the close of the day's work. We believe, however, a nickel solution for your purpose should have the following composition. Water, 1 gallon; double nickel salts, 8 ozs.; single nickel salts, 4 ozs.; boracic acid, 1½ ozs. Dissolve the salts all together in half gallon boiling water, add the balance cold, operate at normal temperature and current conditions.—C. H. P. Problem 3,686.

PEELING NICKEL

Q.—I am asking you for advice on nickel plating. I am employed in a shop where nickel plating automobile parts is being done and we are having a lot of trouble with peeling of nickel. We clean them off with lime before plating; also advise me if lime is all right for cleaning or if there is anything better than lime for taking grease off. We put them right in the nickel without copper plating. Let me know of a cleaning fluid for electric cleaners as we have none here, also where I can get it.

A.—An electro cleaner for cleansing radiator shells should be prepared from water, 1 gallon; caustic potash, 4 ozs.; soda ash, 58%, 2 ozs.; sodium cyanide, ½ oz. Temperature, 160-180 deg. F. at 6 volts and upwards. Use a steel tank and connect as the anode factor. As a final cleaner, mix equal parts of lime and pumice stone with water; to every pint of water used add 2 ozs. sodium cyanide. To your nickel solution add 1 oz. boracic acid and 1 oz. sal-ammoniac per gallon of solution. Dissolve the materials in boiling water before adding to the nickel solution. The cleansing as outlined and additions to your nickel solution should overcome the peeling of the nickel deposit. You can purchase the materials for cleaner from any chemical firm.— C. H. P. Problem 3,687

STREAKING COPPER

Q.—I have a copper solution composed of carbonate of copper, sodium cyanide, bicarbonate of soda, bisulphite of soda, and a little hyposulphite of soda for brightening agent. In plating, regardless of the metal, tin or brass, it leaves a brass streak where the wire rack rests. In oxidizing this work the brass streak covers but is not the same color as the rest of the surface.

A.—We believe that if it were possible to heat your copper solution, your problem would be readily overcome because increase in temperature in copper cyanide solutions decreases the internal resistance and consequently the conductivity is increased. We suggest that you try out a ten-gallon test solution with the addition of the following materials per gallon of solution: Sodium syanide, 1 oz.; bisulphite of soda, 1 oz.; caustic soda, ½ oz. Add the materials in the order given to the test solution. If the copper deposit is satisfactory from the test solution, then your regular solution should be treated accordingly. The factors mentioned will increase anodic reduction and resulting greater throwing power and should solve your problem.—C. H. P. Problem 3,688.

TANK LINING

Q.—We have a steel silver plating tank 24" x 24" x 6' long, a nickel plating tank of the same size, and also a silver strike tank 24" x 24" x 24".

We had formerly used slate tanks which gave us service for about eighteen years. These were replaced with steel tanks last fall and these were coated with a regular tank lining. This lining we find, especially in the silver tanks, is starting to slough off here and there and we would like to know if it would be feasible to line the inside of these tanks with pure sheet lead or monel metal.

We believe that the cyanide in the silver solution attacks the lead and thought perhaps we could use Monel metal and have the corners electric welded with Monel rod.

We would like to ask you whether or not we are correct regarding the lead lining in the silver solution and also whether Monel metal would be satisfactory both for the silver and nickel.

Possibly you could advise some other lining for these tanks.

A.—It is unfortunate that you did not replace your old slate tanks with new ones; eighteen years service proved their value. If you line your present steel tanks with lead or Monel metal you will have to protect the metals with an asphaltum coating to prevent local action of the solution upon them. Steel tanks are now being used with satisfactory results when properly coated with asphalt pitch. The best procedure and most permanent method to coat the steel tanks is as follows:

Spot weld or solder regular galvanized iron wire (square mesh) cloth such as is used for chicken coops, etc., on the inside of the tank. The sides and ends should be so covered when this is completed. Then the tank should be laid on its side and leveled up with a spirit level. To the edge of the tank should be secured a strip of wood to regulate the thickness of the asphaltum pitch. The strip will have to be secured by strips at the bottom of the tank and the sides to hold the front strip securely in place. The thickness of the asphalt pitch should be at least ¼" thick. Melt asphalt pitch in an iron kettle to the boiling point. A little coal tar may have to be added to reduce its brittleness. You can test it out by dropping the molten mixture in cold water. If it snaps in two at once, then add a little coal tar to toughen it so it will slightly bend without breaking into two parts. When all is ready, pour the molten mixture into the tank so that a solid wall results at least ¼" thick. When cold, treat the other side and ends the same way; the bottom accordingly. You will not require wire mesh in the bottom of the tank, just level up the tank and pour the molten mixture in the required thickness. Upon completion, you will have a reinforced asphalt lining that should be good for twenty years or more.—C. H. P. Problem 3,689.

VERDE ANTIQUE

Q.—We have a number of bronze windows, the frames of which we have built up of extruded bronze shapes, the composition of which is known as architectural bronze. The grille work for these windows is composed of cast bronze panels. The whole window is to take a verde antique finish by acid. We are experiencing difficulty in securing this finish on the extruded sections, as it either does not take the finish uniformly or softens up in damp weather.

A.—We suggest the following formula for antique verde solution best adapted to extruded bronze metal. We might mention, however, that it is always advisable to darken the bronze before applying the verde solution. The best solution for darkening or oxidizing is as follows:

Water	1 gallon
Polysulphide	1 oz.
Caustic potash	1 oz.

Temperature, 180 deg. F.

Immerse the bronze panels in the solution for a few moments, then wash in cold and boiling waters; dry before applying the verde antique solution.

Verde antique bronze solution:

Muriatic acid	1 quart
Powdered verdigris	3 lbs.
White powdered arsenic	8 ozs.
Copper carbonate, dry	8 ozs.
Sal-ammoniac, powdered	3 lbs.
Water	3 quarts

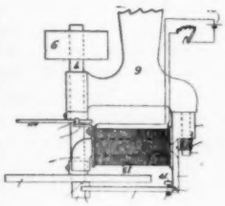
To prepare the solution, heat the muriatic acid in an enameled kettle to 140 deg. F., then add the arsenic; cool the solution down to 100 deg. F., then add the verdigris and copper carbonate. Stir thoroughly. In the 3 quarts of water, heated to 140 deg. F., dissolve the sal-ammoniac, then mix with the solution first prepared. Apply when cooled down to normal temperature with a round painters' sash brush. Apply with a stippling motion; avoid using an excess of the verde solution upon the brush. When the verde is dry and hard, then it should be protected from atmospheric action by a thin coat of Johnson's floor wax. Finally, lightly polish with a soft cloth. By the use of the oxidizing solution outlined and then the final wax finish, your present verde solution could be used.—C. H. P. Problem 3,690.

PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

1,636,557. July 19, 1927. **Polishing Machine.** Robert G. Guthrie, Chicago, Ill.

A polishing apparatus of the character described comprising in combination a work holder adapted to hold the work therein, a polishing disk, electromagnetic means for keeping the work in polishing contact with the said disk, non-magnetic means for positioning the work holder and work on the said disk, means for rotating the disk to polish the work and keep it in position in said non-magnetic means and means for automatically moving the work over said polishing disk during the polishing operation.



1,636,881. July 26, 1927. **Process for Purifying or Refining Metals and Alloys.** David Ronald Tullis, Clydebank, Scotland.

A process of purifying or refining aluminum and its alloys consisting in introducing into the metal or alloy boron trichloride.

1,637,566. August 2, 1927. **Die-Casting Machine.** John S. Gullborg, Chicago, Ill., assignor to Alemite Die-Casting & Mfg. Co., Chicago, Ill.

In a die casting machine, the combination of die mechanism, a relatively stationary metal pot, a nozzle dipping in said pot, said nozzle having upwardly turned ends, one of said ends having a compressed air connection, an upwardly pointed nozzle spout at the other end of said nozzle, means for moving said nozzle relative to said pot to bring said nozzle spout into communication with the under side of said die mechanism for transferring the molten metal thereto, and spring means cooperating with said last named means for holding said nozzle spout in resilient engagement with said die mechanism.

1,637,707. August 2, 1927. **Method of Manufacturing Crucibles and the Like.** Harold E. Porter, Bayside, N. Y., assignor to Charlotte T. Porter.

The process of manufacturing crucibles and the like, which consists in depositing the crucible forming material in the mold shaped to form the outer surface of the crucible, compressing said material with a former having continuous side and bottom walls to form the inner surface of said crucible, and rotating said mold and crucible forming material relative to the former while the material is undergoing compression.

1,637,708. August 2, 1927. **Machine for the Manufacture of Crucibles and the Like.** Harold E. Porter, Bayside, N. Y., assignor to Charlotte T. Porter.

A machine for manufacturing crucibles and the like, comprising a mold into which the crucible forming material is deposited, a hollow, flexible and expansible punch movable into the mold to partially compress said material, means for expanding the punch after it has entered the mold to further compress said material.

1,638,076. August 9, 1927. **Process of Hardening Copper.** William H. Weiser, Dallas, Ore.

In a process of hardening copper, reducing the copper to a molten mass, and injecting into the same a quantity of pulverized magnesia.

1,638,273. August 9, 1927. **Method and Composition of Matter for Surface-Treating Aluminum.** Aladar Pacz, East Cleveland, Ohio.

The process of surface treating metallic articles consisting at least superficially of aluminum which contains the step of immersing the article in a solution containing a soluble fluo-silicate, a salt of a non-ferrous iron group metal, and an alkali salt.

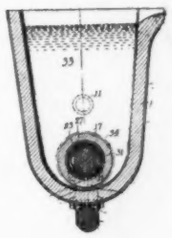
1,638,471. August 9, 1927. **Process of Reacting Metals with Gases.** Hector Russell Carveth, Niagara Falls, N. Y., assignor to The Roessler & Hasslacher Chemical Company, New York, N. Y.

The process of oxidizing a metal which consists in mixing the molten metal with sufficient inert pulverulent material to maintain the mixture in a powdered condition at the reaction temperature and adding oxygen at such rate as to maintain a reaction temperature below the fusion point of said inert material.

1,638,579. August 9, 1927. Coating Compositions. Carl D. Hocker, East Orange, N. J., assignor to Western Electric Company, Incorporated, New York, N. Y.

The process of forming a liquid coating composition which comprises heating a mixture of resin oil and gelatinizable vegetable oil, mixing therewith a substance to give a quick baking quality to said coating composition, and heating the mixture.

1,638,660. August 9, 1927. **Electrothermic Crucible.** Charles B. Foley, Dayton, Ohio, assignor to Charles B. Foley, Inc., a Corporation of New York.



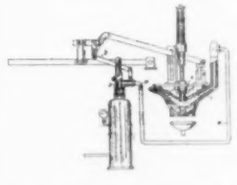
An electric induction furnace, comprising a crucible provided with a refractory channel extending through the crucible from side to side and opening exteriorly thereof, said channel being so located as to produce the greatest heating effect at the bottom of the crucible and having its sides so arranged relatively to the sides of the crucible as to leave a passage between them which increases in cross-section upwardly, in combination with induction means passing through said channel.

1,638,665. August 9, 1927. **Molding Machine.** Wilfred Lewis, Haverford, Pa., assignor to The Tabor Manufacturing Company, Philadelphia, Pa.

A molding machine including a pair of spaced lifting plungers arranged at each side of the machine, a lifting head for each pair of plungers, a double armed crank shaft mounted in each head and whereof one arm is a mold table carrier arm and whereof the other arm is a rollover arm, a rollover cylinder, a piston interposed between each lifting head and its rollover arm, parallel motion cable gear accommodated by the space provided between the lifting plungers of each pair of plungers and adapted to secure synchronous movement of said lifting heads, a mold table having detachable lift off pin connection with the table carrying arms, jar ramming and flask receiving mechanisms accommodated by the space provided between the pairs of plungers, and spring locking mechanism carried by the mold table for normally locking the mold table to the table carrying arms and adapted to be released by contact with the top face of the jar ramming mechanism.

1,638,717. August 9, 1927. **Die-Casting Machine.** Emil Thieslack, Berlin, Germany.

A die casting machine comprising a melting reservoir, a casting reservoir arranged immediately therebeneath, the bottom of the melting reservoir serving as the top of the casting reservoir, an upright hollow boss rising from the bottom of the melting reservoir and provided in its wall with a lateral opening which serves to establish communication between the reservoirs, a sleeve-like valve movably mounted exteriorly of the boss for controlling the passage of fluids through said opening, means for supplying fluid under pressure to said casting reservoir to facilitate ejecting of the contents subsequent to the closing of the opening by the sleeve, and the top of the boss being closed so as to prevent action of the pressure supply means on the valve.



1,638,882. August 16, 1927. **Apparatus for Coating Zinc Bars With Lead.** Adolph H. Rossbach, Columbus, Ohio.

An apparatus for coating zinc bars with lead, consisting of a tank in tubular form having a degree of curvature permitting of the passage of a zinc bar endwise therethrough with slight flexure, the curvature of the tank being sufficient to provide upwardly opening ends with horizontal edges to form boxes

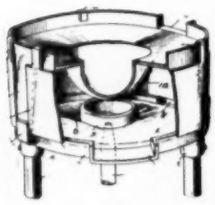
for the reception of a flux at one end and a dissolvent at the other end upon the surfaces of molten lead within the tank.

1,639,070. August 16, 1927. **Removal of Coatings.** William H. Allen, Detroit, Mich.

The process of removing coatings of enamels, lacquers, and the like from articles which comprises heating said coated articles in a solution of caustic alkali containing poly-sulphides of the alkali being used.

1,639,330. August 16, 1927. **Method of Making Alloys.** Jean H. L. De Bats, East Orange, N. J., assignor to De Bats Metals Company, Bloomfield, N. J.

The method of alloying nickel with metals of the chromium group which consists in superposing a mixture of metals of the chromium group in finely divided condition upon a body of nickel in unmelted condition, heating the nickel to a temperature above its melting point but not above the melting point of any of the metals of the chromium group and mechanically mixing the superposed finely divided mixture of metals of the chromium group with the molten nickel.



1,639,380. August 16, 1927. **Melting Pot.** Joseph O. Luthy, San Antonio, Tex.

A melting pot comprising a central bowl, a shelf surrounding, extending from and inclined toward the periphery of the bowl to support the material being melted, means for supporting the shelf and bowl, and a burner disposed below the bowl.

1,639,395. August 16, 1927. **Adhesive Lacquer or Varnish Composition.** Charles R. Bragdon, Cincinnati, Ohio, assignor to The Ault & Wiborg Company, Cincinnati, Ohio.

A lacquer or varnish composition which is non-adhesive at ordinary temperatures after baking, but which will become strongly adhesive when subsequently heated, which includes a mixture of varnish resins, consisting of copal resin and rosin; drying and semi-drying oils; calcium hydrate, resinate of manganese; and a bituminous coloring material,—substantially in the proportions as described, the mixture being reduced to liquid form by the addition of mineral spirits.

1,640,161. August 23, 1927. **Alumino Solder.** Muraji Toril, Kamakuragori, Japan.

Allumino-solder containing 20-70% of zinc, 20-70% of tin, 5-35% of lead, 3-50% of cadmium, 1-5% of tin phosphide and 1-5% of magnesium, substantially as described.

1,640,486. August 30, 1927. **Refining Lead.** Philip W. Davis, Cambridge, Mass.

The method of refining lead which consists in exposing lead alloys in molten condition to the action of litharge by causing the two materials to be exposed to each other in bodies of small dimensions and at temperatures between the melting point of litharge carrying the alloy metal and the melting point of pure litharge (approximately 883° C.).

1,640,487. August 30, 1927. **Refining Lead.** Philip W. Davis, Cambridge, Mass.

The method of refining lead which consists in first exposing lead alloys in molten condition to the action of pulverulent litharge by causing the two materials to be exposed to each other in bodies of small dimensions and at temperatures between the melting point of litharge carrying the alloy metal and the melting point of pure litharge, and second, subjecting the lead alloy product of the first step in molten condition to the action of molten litharge by causing the two materials to be exposed to each other in bodies of small dimensions at temperatures above the melting point of pure litharge.

1,640,574. August 30, 1927. **Smelting Furnace.** Tannie Lewin, St. Louis, Mo., assignor of one-half to William Lewin, St. Louis, Mo.

In a smelting furnace, an elongated cylindrical shell, closure-heads disposed on the ends of the shell, rings fixed circumferentially about the shell adjacent the ends thereof, and fastening members engaging the heads and rings for detachably securing the heads to the shell.

1,640,843. August 30, 1927. **Mold for Casting Metals.** Charles E. Magill, Cleveland, Ohio, assignor to The Aluminum Company of America, Cleveland, Ohio.

In a mold for casting metallic articles, the combination of a flask, granular material in the flask provided with a casting cavity, cores in the casting cavity, a thin metal cope on the flask forming top walls of the casting cavity and provided with perforations, liners of refractory material in the said perforations having close fitting contact with the sides of the perforations; the said perforations in the cope being larger than the greatest cross sectional dimensions of metal solidifying therein.

1,641,422. September 6, 1927. **Compound to Solder Aluminum.** George E. Gail, Detroit, Mich., assignor of one-half to Alex Seitz, Wayne County, Mich.

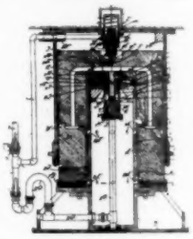
The method of compounding an aluminum solder which consists in first melting approximately nine and a quarter pounds of zinc, pouring the molten mass of zinc into a chilling fluid to close the pores of the zinc, remelting the zinc, slowly adding thereto approximately fifteen and a quarter pounds of block tin, then separately adding slowly approximately one-quarter pound each of lead and phosphorous tin, stirring the mass to thoroughly intermix said ingredients, then immersing and maintaining near the bottom of the mass a block of wood to effect the boiling of the mass, and finally adding approximately one-quarter ounce of pure beeswax to the mass for separating the impurities therefrom for removal at the surface of the boiling mass.

1,641,529. September 6, 1927. **Pyroxylin-Lacquer Composition.** Bruce K. Brown and Charles Bogin, Terre Haute, Ind., assignors to Commercial Solvents Coroporation, Terre Haute, Ind.

A composition of matter comprising pyroxylin and butyl stearate.

A new composition of matter comprising butyl stearate.

1,642,074. September 13, 1927. **Jar-Molding Machine.** Wilfred Lewis, Haverford, Pa., assignor to The Tabor Manufacturing Company, Philadelphia, Pennsylvania.



In a jar molding machine having an anvil and a jarring table operating therewith and actuated by compressed air through a cylinder and hollow piston, air exhaust passages leading from the cylinder and connected with the hollow piston and air exhaust passages leading from the hollow piston directed horizontally into the space between the anvil and the jarring table.

1,642,238. September 13, 1927. **Plating and Method of Accomplishing the Same.** Henry Gardner, Detroit, Mich., assignor to Ford Motor Company, Highland Park, Mich.

A solution for a nickel plating tank comprising the following ingredients in the proportions set forth, to one gallon of water, add 8 ounces of nickel ammonium sulphate, 4 ounces nickel sulphate, 2 ounces boracic acid, 1/32 ounce sal-ammoniac, 3 pennyweights cadmium chloride, 1½ ounces glycerine.

1,642,309. September 13, 1927. **Process for the Production of a Weatherproof Oxide Layer on Electron Metal.** Willy Pieper, Nuremberg, Germany, assignor to J. B. Soellner Nachf. Reisszeugfabrik A. G., Nuremberg, Germany.

A process of producing a weather-proof protecting coating on electron-metal and similar metals by oxidatioa, consisting in using for the oxidation a solution of sodium hydroxide and of chemical substances giving off oxygen, such solution containing potassium nitrate, said solution being free from any oily matter.

1,642,347. September 13, 1927. **Bearing.** Harry M. Williams and Alfred L. Boegehold, Dayton, Ohio, assignor to General Motors Research Corporation, Dayton, Ohio.

The process which comprises intimately mixing finely divided copper, tin, and salicylic acid; compressing the mixture into the desired form under a pressure of about 80,000 lbs. per sq. in., and heating the resultant formed article to about 675° C. in a non-oxidizing atmosphere.

1,642,348. September 13, 1927. **Alloy Structure.** Harry M. Williams and Alfred L. Boegehold, Dayton, Ohio, assignors to General Motors Research Corporation, Dayton, Ohio.

A process comprising intimately mixing finely divided alloyable metals, and finely divided material that volatilizes under heat, compressing the mixture into a desired form, and heating in the presence of a volatile flux to a temperature sufficient to cause alloyage of the metals.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

AUTOMATIC COMBINATION POINTER AND THREADER

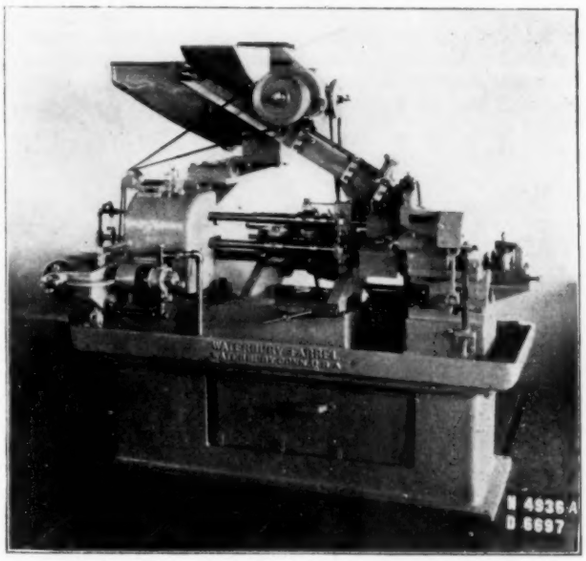
The Waterbury Farrel Foundry & Machine Company of Waterbury, Connecticut, is now offering a new automatic machine for pointing and cutting threads on bolts. The pointing is done with a box tool and the threading with a standard die-head of any specified commercial type.

The blanks pass from a rotor hopper, equipped with a clearing wheel to assure correct feeding, down an inclined chute to a stop. At this point, a spring pusher forces the blanks successively into a carrier on a swing sector which operates parallel to the chute. The sector carrier swings the blank down to the carry-in slide which transfers the work to the pointing station. The upward swing of the carrier causes the pusher to recede, which allows the next blank to drop down to the stop and be pushed into the sector carrier.

The carry-in slide has a plate attached in which the blank is held by spring pressure while being transferred. At the end of the carry-in movement, the blank becomes clamped against adjustably fixed jaws, where it is held in line with the pointing tool. After pointing, the blank is swung downward by a pair of spring fingers to the threading station, where it is clamped between a pair of jaws. These jaws hold the blank by yielding pressure and are opened after threading by cam action. The threading of one blank and the pointing of the next one occurs simultaneously.

The threaded blanks drop into a chute of hinged construction which leads to a work-box at the rear. The work rolls down, after which a hinged pan on the chute swings down so that the chips pass to a removable box in the pedestal. Thus the work and chips are automatically separated. The surplus lubricant drips from the end of the chute into a pan in which the work-box is located and thence to the supply tank in the pedestal; likewise the lubricant from the work drains from the box back to the common reservoir. The work-box is provided with a hand-lever to pivot it and dump the work.

The machine can be readily arranged for either right-angle or straight belt drive to an overhead countershaft or lineshaft, as well as for individual motor drive; it can also be started and stopped from either side. These drive and control features are an advantage in the installation of the machine, enabling it to be located wherever desired without rearrangement.

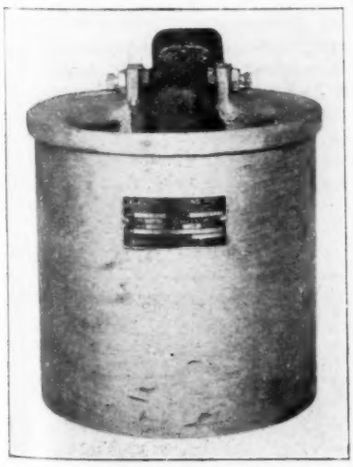


AUTOMATIC COMBINATION POINTER AND THREADER

SMALL ELECTRIC MELTING POT

A new electric melting pot has been introduced for melting solder, lead, babbitt, tin, etc., which has a capacity of from 27 to 40 pounds, according to the metal to be melted. This pot may be operated on either 110- or 220-volt alternating or direct current circuits and is made in two ratings, 750 and 1,000 watts.

The new pot is a General Electric product and is the smallest size of the G.-E., RP form E line. It consists of a durable sheet steel cylindrical casing ten inches deep and nine inches in diameter, in which is supported a cast iron crucible 4″ deep, 6″ dia.



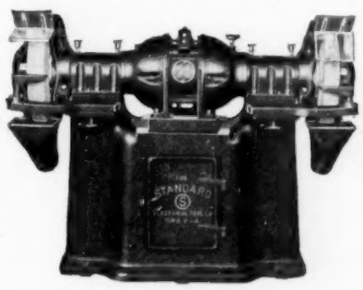
ELECTRIC MELTING POT

Heating units are of the cast-in, sheath-wire type so successfully applied to metal melting. One unit is used in each pot, dissipating 750 watts in one rating, and 1,000 watts in the other. The leads of the unit are brought over the top of the pot into a connection box fixed to the unit itself. The new pot is designed for melting lead, babbit, tin, solder and similar alloys or metals, except spelter or zinc, at temperatures not exceeding 950 deg. F. Detailed capacities follow: for 50/50 solder, 30 pounds; for lead, 40 pounds; for babbitt, 37 pounds, and for tin, 27 pounds. The approximate shipping weight is 50 pounds.

HEAVY-DUTY GRINDER

The heavy-duty electrically driven grinder, illustrated, has been added to the line of similar equipment put out by the Standard Electrical Tool Company, Cincinnati, Ohio. The machine is made in three sizes of 5, 7½ and 10 H. P. capacity.

The 5 H. P. grinder carries two wheels, 18″ in diameter with



HEAVY DUTY GRINDER

3″ face, and weighs 1920 lbs. The 7½ H. P. grinder carries wheels 24″ in diameter by 4″ face and weighs 2,020 lbs. The 10 H. P. grinder carries wheels 24″ in diameter by 4¾″ face, and has a weight of 2,375 lbs.

The grinders are equipped with 40 degree General Electric motor, having push-button control. Four S. K. F. deep-groove ball bearings are used to support spindle. The bearings are encased in dust proof chambers, and the armature shafts that they carry are made of a high-grade nickel steel. A locking device is provided to hold shaft when changing wheels.

The emery wheel guards are of a heavy construction and are of the hinge door type with exhaust connections. Each guard is fitted with a spark breaker as well as a polished, wired glass eye shield.

TURNING CRUSHERS

Many of the industries which produce turnings, are crushing them to a shoveling product. The crushing of long, curly turnings is not a new idea as many plants have been using turning crushers for several years.

The American Ring Turnings crusher is said to be a rugged machine capable of crushing or shredding the long, fluffy, curly turnings obtained from automatic screw machines, lathes, etc., to a shovel product. It is built upon the patented rolling ring principle. The flexibility of the patented manganese steel shredder ring system and the patented automatic apron protects the machine against injury from solid metal contained in the turnings. It is built by the American Pulverizer Company, St. Louis, Mo.

It is often not practical and almost impossible to keep solid pieces of metal such as gear blanks, shaft ends, bolts, etc., separate from the turnings. The American crusher is claimed to be the only machine equipped with an automatic apron that permits the successful handling of the solid metal contained in the turnings. This crusher equipped with steel feed hopper, flexible coupling and mounted on base plate for direct motor drive is shown below.

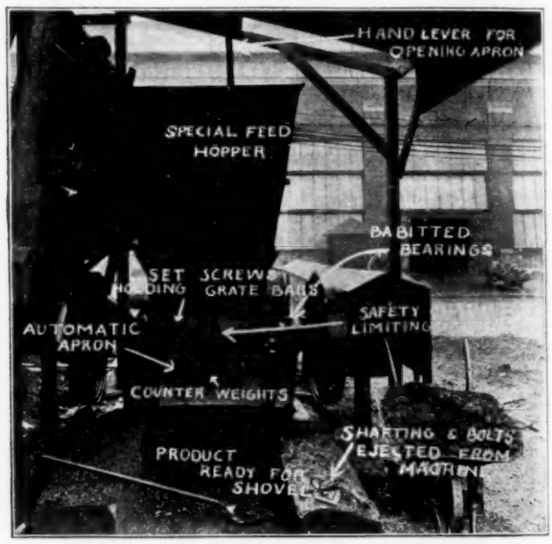
RING TURNINGS CRUSHER

The American crusher is built in a number of sizes—one half ton per hour to eight tons per hour. These crushers are equipped with pulley for belt drive or with flexible coupling and mounted on base plate for direct motor drive. A typical installation is shown alongside.

The General Electric Company and the Westinghouse Electric & Manufacturing Company are using these machines for crushing non-ferrous turnings. The Century Electric Company is separating the steel and brass turnings by crushing them in this machine, afterwards passing the product over a magnetic pulley to eliminate the steel.

Only one point has to be considered when a separation is required between steel and non-magnetic material. In case the steel parts are imbeded in the metal turnings and they are so small that they will pass the smallest grate bar and therefore not be ground or cut, these metal parts will be carried over by the steel contained in their center so that no clean separation can take place. This is the experience had with metal turnings from very small motors. But in all other cases the crushing of brass, copper or babbitt turnings is accomplished in a very satisfactory way—especially the crushing of babbitt turnings—to remove the higher grade metals contained in the babbitt.

A very interesting application of this machine is made in breaking up aluminum crank cases in the automobile plants and in scrap yards. A crank case of 8 cylinders can be placed in the machine and is reduced in one operation to about 3" size—very handy for re-melting.



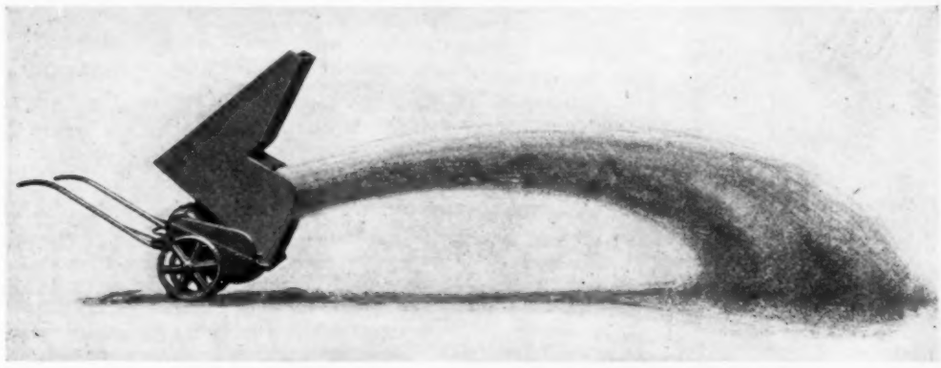
TYPICAL CRUSHER INSTALLATION

SAND-CONDITIONING EQUIPMENT

The conditioning of foundry sand by mechanical means has long since passed the experimental stage, and it is rapidly being accepted as standard practice by the larger foundries.

For some time, however, there has been a consistent demand for a portable, yet thoroughly effective sand-conditioning machine which would fill the needs of the small foundry. The Production Equipment Company, 5213 Windson Avenue, Cleveland, Ohio, has recently placed such a machine on the market. It is known as the Model H Cleveland sand-conditioner. It is said to be a light, yet sturdy machine which can be handled and operated by one man easily.

It consists normally of a sheet metal hopper attached to a housing containing a motor-driven cutting cylinder, the entire unit being mounted on a structural steel frame. The housing is split



CLEVELAND SAND CONDITIONER—MODEL H

horizontally so that the entire top can be easily removed for inspection of the working parts. The sand is shoveled into the hopper, which directs it against the rapidly-revolving cylinder. This breaks up the sand, separates blends and aerates it, and throws it in a long finely-divided stream into a cool fluffy heap.

The cutting cylinder whips the sand radially and laterally thus assuring thorough re-conditioning of the sand before it is sprayed from the hopper as described above. This cutting cylinder is driven through a silent chain drive by a "Security Three Year Guarantee" electric motor, ball-bearing type. Both motor and chain drive are totally enclosed to protect them from the abrasive action of the sand.

When it is desired to riddle the sand before re-use, an inclined screen or a power-driven riddle is also supplied. These are made either entirely separate, attachable to and removable from the sand-conditioner, or permanently connected to same. Particular attention has been given, it is stated, to assuring easy maintenance and low upkeep cost. The few parts subject to wear are easily accessible, and there are no belts or other quickly-wearing parts to get out of order.

SMALL CASTING MACHINE

R. E. Byrd, Erie, Pa., is the manufacturer of a small die casting machine for light work in lead or tin base alloys, called the 100J machine. This machine is 44 inches high, takes up little floor space and weighs 40 lbs. When using a single, two-piece die with no cores, 80 to 125 operations per hour can be performed.

The machine is operated by placing the die on the nozzle, depressing the lever slightly, lifting the lever quickly, removing the die and ejecting the finished casting. The melting pot holds 15 lbs. of metal and the machine will displace up to 1 lb. of metal into the die cavity.

EQUIPMENT AND SUPPLY CATALOGS

Led-Hed Nails. Hoyt Metal Company, St. Louis, Mo.

Electric Furnaces. W. S. Rockwell Company, New York.

Foundry Supplies. Paxson-Taggart, Inc., Philadelphia, Pa.

Electric Heat in Industry. National Electric Light Association.

Conco Cranes and Trolleys. H. D. Conkey and Company, Mendota, Ill.

Pyro Optical Pyrometer. The Pyrometer Instruments Company, New York.

Edmoore Power and Demand Limitator. Edward T. Moore, Syracuse, New York.

Bridgeport-Keating Flush Valves. Bridgeport Brass Company, Bridgeport, Conn.

Across the Line Motor Starters.—J-1552. Allen Bradley Company, Milwaukee, Wis.

Continuous Annealing Furnace, conveyor type. W. S. Rockwell Company, New York.

The Chief Engineer Sees the President. The Brown Instrument Company, Philadelphia, Pa.

What Our Foundry Offers the Boy. Brown & Sharpe Manufacturing Company, Providence, R. I.

C. E. Fin Furnace. A steam generating furnace. Combustion Engineering Corporation, New York.

Electricity, the Pathway of Prosperity. Westinghouse Electric and Mfg. Company, East Pittsburgh, Pa.

Continuous Heat-Treating Furnaces. Conveyor type, electric or fuel. W. S. Rockwell Company, New York.

Nickel in the Brass Foundry. A brief resumé of some of its applications. International Nickel Company, New York.

Drying by Ruggles-Coles Dryers. Ruggles-Coles Engineering Division of the Hardinge Company, Inc., York, Pa.

Auto-Plate—for cleansing, pickling or plating operations or any combinations, automatically. Frederic B. Stevens, Inc., Detroit, Mich.

Hilo Lacquer. Technical bulletin No. 11 which treats of the new industrial lacquer, both clear and in colors, put out by the Hilo Varnish Corporation, Brooklyn.

Brass Tacks. Volume 1, No. 1 of a new house organ published by the Bridgeport Brass Company, Bridgeport, Conn. This magazine includes a great deal of helpful information about brass, written by experts of the company.

General Electric Publications. BTA Motors; General Purpose Synchronous Motors "7500 Series"; Metal-Melting Pots and Equipment; Adjustable Varying Speed Motors; Squirrel Cage Motors; Air Compressor Governors; Vertical Induction Motors; Totally Enclosed Induction Motors; Clamp-On Units; General Purpose Squirrel Cage Motors; Duplex Controllers; Pressure and Vacuum Switches; Magnetic Reversing Switches; Motor-Starting Switches; Jack Type Disconnecting Switches; Horizontal Edgewise Instruments; Battery Charging Equipments; Push Button Stations.

ASSOCIATIONS and SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

AMERICAN FOUNDRYMEN'S ASSOCIATION

HEADQUARTERS, 140 SOUTH DEARBORN STREET, CHICAGO, ILL.

1928 CONVENTION AND EXHIBIT

Announcement is made to all former exhibitors at A. F. A. Conventions that the next exhibit of foundry machines, equipment, materials and supplies will be held in Philadelphia, the week of May 14th, 1928, in conjunction with the Annual Convention of the Association.

All exhibits will be installed in one large hall which is well lighted, has good headroom and concrete floor. The digging of pits is permissible, and every type of exhibit common to these conventions will be provided for.

This will be the first meeting of the Association along the Atlantic Seaboard since 1919, and there is every indication that the 1928 Convention and Exhibit will excell the great International Convention held in Detroit in the fall of 1926. The occasion offers a real opportunity to manufacturers for exhibiting new machines and showing latest improvements in standard equipment.

AMERICAN ELECTRO-PLATERS' SOCIETY

NEW YORK BRANCH

HEADQUARTERS, CARE OF R. J. LIGUORI, 127 VANDERBILT AVENUE, BROOKLYN, N. Y.

The New York branch held its regular meetings August 12th and 26th. For the first meeting several formulae were discussed, such as the cleaning and plating of iron and aluminum; chromium solutions used by members; also racks for work.

The discussions proved of great interest to those present. Members should come to these meetings and tell something worth while, voice their opinions and make this branch what it ought to be.

BRIDGEPORT BRANCH

HEADQUARTERS, CARE OF W. A. EHRENCRONA, 872 HANCOCK AVENUE

The Bridgeport Branch of The American Electro-Platers' Society held its Seventh Annual Outing on Saturday afternoon, September 17, 1927, at the Interdale Inn, Milford, Conn.

Athletic events, including baseball and tug-of-war began at 2 p. m.

The winner of each event was awarded a prize. Dinner was served at 5 p. m. sharp.

FINISHERS' EQUIPMENT ASSOCIATION

HEADQUARTERS, CARE OF T. J. DONNELLY, JR., EASTERN FELT COMPANY, 10 HIGH STREET, BOSTON, MASS.

The Metal Finishers Equipment and Materials Association held its second meeting September 24-25 at the Clifton Hotel, Niagara Falls, Canada, with 24 members attending. Reports of progress will be forthcoming at a later date.

ORNAMENTAL BRONZE MANUFACTURERS

HEADQUARTERS, 622 BROADWAY, CINCINNATI, OHIO

The National Association of Ornamental Iron and Bronze Manufacturers has just issued a very attractive 68 page reference book, size 8½ x 11 inches entitled "Ornamental Iron, Bronze and Wire Work" for Use of Architects and Others.

This book is fully illustrated with various kinds of ornamental iron, bronze and wire work produced by its members with brief specifications to make them more serviceable and useful to architects. An introduction to this practical book has been written by the prominent architect, Harvey Wiley Corbett of the New York City firm of architects Helmle Corbett and Harrison. It is entitled: "Ornamental Iron and Bronze, Its Place in the Building Scheme."

LIGHTING EQUIPMENT ASSOCIATION

711 GRAYBAR BUILDING, NEW YORK CITY

For the first time in its history, the lighting equipment industry is presenting a united front in a well planned effort to correct evils, enlarge the market, raise the standard of quality, design, finish and workmanship, and create a greater consciousness of what constitutes good lighting and good equipment, both from a utilitarian as well as an artistic standpoint.

Early October will see every concern affiliated with the Artistic Lighting Equipment Association actively engaged in an intensive Membership Campaign Drive to secure the support of all eligible houses interested in or allied with the Lighting Equipment Industry.

The drive is in charge of Herman Plaut, President of L. Plaut and Company, New York, who is Chairman of the Campaign Committee; and M. D. Blitzer, Vice-President and General Manager of the Lightolier Company, New York, Chairman of the Standing Membership Committee of the A. L. E. A. Sectional activities will be under the direction of a number of District Chairmen:

While the object of the Campaign is to increase the membership of the A. L. E. A., the real purpose or basis is to permit of a greater cooperative activity in meeting the "new competition" brought about by modern business conditions, and to promote the industry through refixturing and replacement campaigns in cooperation or harmony with those other elements in the electrical field most closely affected.

AMERICAN MANAGEMENT ASSOCIATION

HEADQUARTERS, 20 VESEY STREET, NEW YORK.

The metal and machinery industries are prominently represented in a group of forty-one leading business executives who have organized an Advisory Board of the American Management Asociation, feeling that improved management methods are essential in maintaining present prosperity and that knowledge of such methods should be spread more quickly throughout business.

A. J. Roos, 1st Vice-President & Treasurer, Diebold Safe & Lock Company; **C. F. Dietz**, President, Bridgeport Brass Company; **Sam A. Lewisohn**, Vice-President, Miami Copper Company; **Edgar S. Bloom**, President, Western Electric Company; **E. M. Herr**, President, Westinghouse Electric & Manufacturing Company; **M. E. Leeds**, President, Leeds & Northrup Company; **F. A. Scott**, President, the Warner & Swasey Company, and **B. L. Wordin**, President, Cutler-Hammer Manufacturing Company, are on the Board. A wide range of industries and some of the largest corporations in the country are represented.

Both production and distribution will be included in the scope of the board, which will serve in guiding the policies of the Association and in focussing its increased research facilities on pressing industrial problems. Among the fields in which new management methods are now being developed and tested by the association and its members are those of labor efficiency and labor relations, financial control, etc.

Personals

D. J. McADAM, JR.

D. J. McAdam, Jr., who was awarded the Charles B. Dudley medal of the American Society for Testing Materials in June, 1927, was graduated at Washington & Jefferson with the degree of A. B. He later received the degree of A. M. from the same college. After two years spent in graduate work in Chemistry and Physics at Harvard, he continued his studies in Chemistry at the University of Pennsylvania. He received the degrees of M. S. and Ph. D. from the University of Pennsylvania. After a few years as Instructor in Chemistry at Lehigh, and in chemical work at the Department of Agriculture, he assumed his present position as Metallurgist, U. S. Naval Engineering Experiment Station.

He has presented a number of papers on metallurgy before the American Society for Testing Materials, American Society for Steel Treating and Institute of Metals. Perhaps the most important papers have discussed corrosion-fatigue of metals.

D. J. McADAM, JR.

Paul Blackburn has recently became associated with Weaver Brothers Company at Clinton, Mich.

A. F. Stein, formerly with the Ferro Enameling Company of California, is now in the enameling department of the Regent Stove Company, Wyandotte, Mich.

W. A. Cook, for 57 years in the zinc industry has retired from all active business. He is living in Stamford, Conn. A history of Mr. Cook's career was published in The Metal Industry for March, 1924.

Henry Connor has severed connections with the Chattanooga Stamping and Enameling Company, Chattanooga, Tenn., to become associated with the Ferro Enamel Supply Company of Cleveland, Ohio.

Calm Morrison Hoke of the Jewelers Technical Advice Company, New York, was married to Thomas Robert McDearman on August 25. Miss Hoke is well known to readers of THE METAL INDUSTRY through her articles on precious metal refining.

Albert L. Haasis, manager of the crucible sales department of the Joseph Dixon Crucible Company, Jersey City, N. J., sailed for Europe on August 6th together with John J. Leckie, manager of the pencil sales promotion bureau of the same company. They will travel through England, France, Germany, Holland and Switzerland.

ALBERT L. HAASIS

Obituaries

JOHN T. KELLY

John T. Kelly, organizer of the Kelly & Jones Company, manufacturer of brass and iron fittings and valves, died September 5th at his home in Scarsdale, N. Y. at the age of 74. Mr. Kelly founded the house in 1872 in Greensburg, Pa., and established branches in New York, Pittsburgh, Chicago and San Francisco. He remained as its active head until October, 1925, when it was bought by the Walworth Company of Boston. Born in Allegheny, Pa., Mr. Kelly lived as a young man in Brooklyn and was a member of the Montauk and other clubs there. In 1912 he moved to Scarsdale. His wife, who was Leslie McCune of Pittsburgh, and their sons survive.

Mr. Kelly had three qualities rarely found in one man. His ability as an executive, a salesman and a mechanical engineer touched the plane of genius. His judgment was unfailing and almost unerring as a salesman he had few equals and his mechanical knowledge was extraordinary. Moreover, he was possessed of a broad viewpoint which led him always to give his time and knowledge willingly to the industry in behalf of all movements that were constructive and helpful to the trade. Few men in the field had so many friends and admirers and his death will be recognized by the trade as the passing on of an exceptionally capable business man.

AN OPINION FROM W. J. REARDON

Mr. Kelly was well known in the brass industry and universally respected. He was largely responsible for the advances made in the valve field over the last fifty years. His indomitable fighting spirit has been shown through his long connection with the brass business. In 1889 the Kelly & Jones Company, moved their plant from Jersey City to Greensburg, Pa., and writer came to know the progressiveness of Mr. Kelly as he worked for him at that time. Mr. Kelly's great vision, sound judgment and strong personality and constructive ability had a wide beneficial influence with all he came in contact with. His views were a stimulus to his men as he looked into the future. He was the Grand Old Man of the valve industry, and it owes a great deal to his leadership. He is the last of the three pioneers in the valve business, Harlin of McNab & Harlin, Paterson, N. J., and Crane of the Crane Company of Chicago having been the others.

GERALD JUDSON MARCY

Gerald Judson Marcy, whose death was noted in the September issue of THE METAL INDUSTRY was a former superintendent of the Miller Company, Meriden, Conn. Mr. Marcy was born in Yalesville, Conn., in 1858. He had been identified with the brass business for many years, being connected with the Rome Brass and Copper Company of Rome, N. Y., for thirty years before coming to the Miller company in 1915 where he was superintendent until 1920.

He then became superintendent of the Benson Rolling Mill in Glen Ridge, N. J., and retired about a year ago. He was a member of the Masonic lodge of Rome and was past regent of Alfred H. Hall council, Royal Arcanum of this city and a member of the First Congregational Church. Surviving Mr. Marcy are two sons, L. B. Marcy and L. J. Marcy, and also two grandchildren.

ERNEST BLACKMAN PERRY

Ernest Blackman Perry, president of the Industrial Works, Bay City, Michigan, nationally known manufacturers of cranes, passed away at his home 2230 Center Avenue, August 7, after an illness of one week.

Mr. Perry was born in Prairie Du Chien, Wis., December 9, 1868. He was a son of Walter Scott and Emma Blackman Perry. He received his early education in the public schools of Ann Arbor, Michigan, and when this was completed he entered the University of Michigan, graduating in 1889.

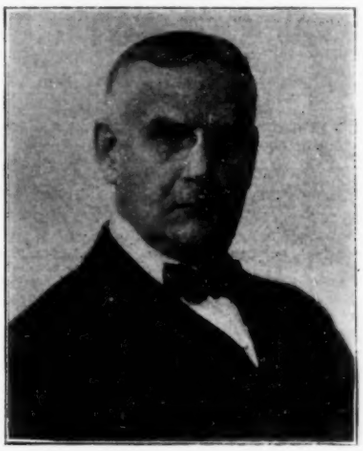
He took a position with the Industrial Works as draftsman and was connected with that firm from that time on. In 1891 he was made superintendent and mechanical engineer, and, later, vice-president and general manager. In 1924 he came into the highest position the company could give him, that of the presidency of the concern. He served in that capacity until his death.

On November 22, 1889, he was married to Susie I. Harwood, of Ann Arbor. To them were born two children, both of whom survive: Harold H. Perry, one of the managing heads of the Industrial Works, and Ernestine H. Perry.

He was a member of the American Society of Mechanical Engineers and was affiliated with various other national organizations. He also was a member of the Rotary Club of Bay City. He was a director of the Research Department of the University of Michigan, as well as a trustee of the University Alumni fund, and through this and other connections he was prominent among those identified with that school's activities.

JOHN B. KENNEDY

John B. Kennedy, president of the English and Mersick Company, New Haven, Conn., hardware makers, and former Major in the Second Company, Governor's Foot Guards, died September 9 in his summer home in Cheshire.



JOHN B. KENNEDY

Mr. Kennedy was born in White Plains, New York on February 24, 1864, the son of John and Cornelia Baldwin Kennedy. He was educated in the Public Schools of New Haven, and in 1880 he entered the employ of English & Mersick as an office boy, and in 1895 was elected President of the company.

He was a member of the Board of Police Commissioners for 14 years and at the time of his death was President of the Board. For 25 years he was a member of the Second Company Governor's Foot Guard, and was Major in command of the organization at the time of the World War. He was a member of Wooster Lodge A. F. and A. M., the Union League and New Haven Country Clubs.

NORRIS B. GREGG

Norris Bradford Gregg, vice-president and a director of the National Lead Company, with offices at 111 Broadway, New York, died suddenly in the Polyclinic Hospital, 345 West Fiftieth Street, New York, following an operation. For the last twenty years, Mr. Gregg had been with the National Lead Company, since 1916 as vice-president. He also had been with the company earlier in his career, but had left it for a time.

JOHNSON R. ABBOTT

Johnson R. Abbott, foundry owner and maker of brass, aluminum and gray iron castings, under his name at Greenfield, Ind., died recently.

CHARLES C. KAGEL

Charles C. Kagel, died August 6, aged 55 years. He was senior member of the Kagel Brothers Company, brass founder, Milwaukee, Wis.

NEWS OF THE INDUSTRY

Industrial and Financial Events

NEW HAVEN BUYS CHROMILITE

The New Haven Sherardizing Company, Hartford, Conn., has purchased all stocks and interest of the Chromilite Process Corporation, and the plant will continue to operate under their personal supervision in the future. The New Haven Sherardizing Company in purchasing this company has guaranteed all creditors 100% on the dollar, although under receivership sale, they were not compelled to do this, but to pay only a per cent in accordance with law. This company has always been able to meet its obligations from the time it was incorporated, and as it was a large stockholder in the above company it was their desire to maintain the good will established and that no one should, under these conditions, suffer except themselves.

It is their intention to operate the Chromilite division at Akron at full capacity, under the same engineering organization and much better conditions.

U. S. STONEWARE BUYS NEW PLANT

Negotiations which have been in progress for some time past have just resulted in the acquisition by the U. S. Stoneware Company of Akron, Ohio, of the plant formerly occupied by the Acid Proof Clay Products Company at Tallmadge, Ohio. The U. S. Stoneware Company are manufacturers of U. S. Standard plating tanks, acid pots, dipping baskets, etc.

It is planned to overhaul the new Tallmadge Works and to install considerable new machinery and equipment designed to allow for more economical production. The new plant will be running at capacity production within 90 days.

Frank S. Wills is President of the U. S. Stoneware Company, John J. Chamberlain is General Manager and S. H. Farkas is Sales Manager.

DIE CASTING MERGER

Formation of the Newton Die Casting Corporation to acquire the assets and business of the die casting division of the National Lead Company and of the Marf Machine and Die Casting Company of Brooklyn has been announced. W. G. Newton, for many years President of the Marf company, will be President and General Manager of the new company. The merger involves no new financing.

AUSTRIAN METAL COMPANIES COMBINE

Four Austrian producers of semi-manufactured metal goods representing over 50 per cent of the total Austrian production of wires, sheets, tubes and rods made from copper, brass, and alpaca will cease to exist as independent firms in the near future, and their works will be taken over by a new joint stock company under German leadership. They are Chaudoir Metallwerke A. G. with factories in Vienna and Oed, Lower Austria; Nadelburger Messing-und Metallwarenfabriks A. G. M.; Hainisch in Nadelburg, Lower Austria; Spezialbronzen & Metallwalzwerke A. G. in Vienna and Metallwerk G. Scheid A. G. in Amstetten, Lower Austria. The well-known German concern Mansfeld A. G. fuer Bergbau represented in Vienna by a subsiding company, the Metall Import A. G., will have a controlling interest in the new company, the capitalization of which is expected to amount to approximately $900,000.

This consolidation has been caused by the prolonged depression in the rolling mill line and by the recent failure of the leading Austrian firm of metal dealers, Jakob Neurath. The four factories were handicapped by insufficient financial facilities, by old fasrioned equipment and the lack of specialization. The Mansfeld A. G., chief creditor, proposed the above merger and a complete reorganization of producing methods, the scheme receiving the support of a leading Austrian bank, the Oesterreichische Bodenkreditanstalt, which holds a controlling interest in the Metallwerk G. Scheid A. G. in Amstetten. The new program is said to provide for the concentration of wire manufacture in Oed and of sheets in the Nadelburg or Amstetten plant. Operations in one or two mills will probably be discontinued.—Foreign Trade Notes, Department of Commerce.

ALUMINUM IN INDIA

The Indian Aluminum Company, Ltd., of Madras, India, reports that the aluminum industry has become very important in India. A large number of small factories have sprung up, however, and the competition is very severe, forcing prices down below the economic limit. Many failures have therefore resulted.

GRAPHITE IN MADAGASCAR

The production of graphite in Madagascar is estimated from the export figures for this material. Figures issued by the Madagascar customs and the Service of Mines show that exports during the first six months of the present year came to 4,076 metric tons, of which 2,042 went to England, 1,404 to France, 383 to Germany, 171 to the United States, 66 to Italy and 10 to Austria.

No shipments of graphite were made from Tamatave after the cyclone and tidal wave of March 3, 1927, until May 22, after the rebuilding of the railway bridge. Exports during June, however, brought up the total for the quarter higher than had been anticipated. The director of the principal warehouse and lighterage company in Tamatave considers that a capacity for the port of two-thirds of maximum tonnage will be reached by October 1, and that by March 1, 1928, the normal situation will have been regained. A large quantity of the graphite stocks at Tamatave is still being dried out after being soaked by the tidal wave. Foreign Trade Notes, Department of Commerce.

RADIO WORLD'S FAIR

The 4th Annual Radio World's Fair was held in the new Madison Square Garden, New York City, September 19-24. Almost all of the receiving set manufacturers were represented and also a number of accessory and supply manufacturers.

It is commonly known that metals are used to a very large extent in radio receiving sets, as steel and iron cannot be used because of their magnetic properties. Brass, copper, aluminum and zinc predominate.

Among firms engaged in the manufacture of metal products exhibiting at this Fair were the Aluminum Company of America, Pittsburgh, Pa., and the Scovill Manufacturing Company, Waterbury, Conn.

MUELLER SALES CONVENTION

The fifth annual salesmen's meeting of the Mueller Brass Company of Port Huron, Michigan, was held September 6 to 9 at the Mueller Golf and Country Club of that city. Twenty-five sales representatives from all parts of the country attended the conference.

The four-day sessions were in the nature of a school, where the Mueller representatives were examined as to their knowledge of Mueller brass and copper products. Papers and talks delivered by officials and executives of the company, together with inspection trips through every department of the mill, gave the sales representatives a complete panoramic and intimate view of every phase of the business. The progress made during the past year in the research laboratory, engineering and manufacturing departments was revealed to the salesmen.

The meeting brought the factory and office heads and the field service men together to talk over their mutual problems, to exchange ideas for the improvement of service to customers, and to encourage and foster interest in their work.

Prizes for having successfully obtained a difficult account, which was assigned to them at the previous annual meeting were awarded to L. A. Mitchell, Steel Sales Corporation, Detroit; W. C. Young, Hughes-Limbach Company, Cleveland; Clayton A. Nenno, Nenno Metals Company, Buffalo; Hal Kleimann, Hunter & Wilkie, Detroit; George Reamer, Flint; H. L. Hess, H. L. Hess Company, Philadelphia.

A five year service pin was also awarded to William M. Orr of Pittsburgh in recognition of five years' service with the company.

The Mueller Golf and Country Club, Inc., where the sessions were held and the salesmen housed, is a subsidiary of Mueller Brass. An 18-hole golf course is now being built, of which ten are completed and in use. This course is open to the general public as well as to the company's employees. Membership and green fees are very moderate, as it is the company's aim to make golf available to the person of average means.

The watering system used at the Mueller club is the only one of its kind in use today. Copper pipe has been laid to each green and disappearing sprinkler heads of brass have been installed in the green so that all greens may be watered automatically. The sprinkling system is supplied with water by a large pump capable of providing water at 100 pounds pressure, and all of the greens can be watered at one time in about 15 minutes. Both the copper pipe and brass sprinkler heads are manufactured by the Mueller Brass Company and are available for commercial use.

CHEMICAL INDUSTRIES EXPOSITION

The 11th Annual Exposition of the chemical industries was held at Grand Central Palace, New York, September 26-October 1st. Although the exhibitors directed their efforts to the firms manufacturing chemicals and chemical products, the equipment and supplies shown were of such character in many cases, as to be applicable to the metal trades as well. A number of metal manufacturers took booths and the program included many familiar names. A list of exhibitors whose products are also featured in the metal field is as follows:

Air Reduction Company, Inc., New York.
Aluminum Company of America, New Kensington, Pa.
American Hard Rubber Company, New York.
American Machine and Foundry Company, Brooklyn, N. Y.
Audubon Wire Cloth Company, Inc., Audubon, N. J.
Bailey Meter Company, Cleveland, Ohio.
Baker and Company, Inc., Newark, N. J.
Botfield Refractories Company, Philadelphia, Pa.
Bristol Company, Waterbury, Conn.
Brown Instrument Company, Philadelphia, Pa.
Chromium Corporation of America, New York.
Comemrcial Solvents Corporation, Terre Haute, Ind.
Dings Magnetic Separator Company, Milwaukee, Wis.
Duriron Company, Inc., Dayton, Ohio.
Everlasting Valve Company, Jersey City, N. J.
Fansteel Products Company, Inc., No. Chicago, Ill.
General Chromium Corporation, Detroit, Mich.
Gross Lead Burning and Coating Corporation, Cleveland, Ohio.
Hardinge Company, Inc., York, Pa.
Hybinette, Victor, Wilmington, Del.
International Nickel Company, New York.
LaMotte Chemical Products Company, Baltimore, Md.
Multi Metal Company, New York.
Newark Wire Cloth Company, Newark N. J.
S. Obermayer Company, Chicago, Ill.
Palo Company, New York.
Quigley Furnace Specialties Company, New York.
Raymond Lead Works, Chicago, Ill.
Sholes, Inc., New York.
Sumet Corporation, New York.
Tennessee Copper and Chemical Corporation, New York.
Tennessee Copper Company, New York.
Uehling Instrument Company, Paterson, N. J.
United Lead Company, New York.
United Lead-Tatham Bros. Works, Philadelphia, Pa.
United Lead Company of Cincinnati, Cincinnati, Ohio.
United Lined Tube and Valve Company, New York.
U. S. Stoneware Company, Akron, Ohio.
Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa.
Weston Electrical Instrument Corporation, Newark, N. J.
Yale and Towne Manufacturing Company, Stamford, Conn.
Young Brothers Company, Detroit, Mich.
Zapon Company, New York.

INCORPORATIONS

Falls Electric Furnace Corporation, Buffalo, N. Y., has been incorporated with 100 shares no par value by Herbert J. McCaulley, 660 Grant Street. This firm will not manufacture for the present, but will have manufactured for them, on a contract basis, electric furnaces of all kinds particularly for the heat treating and ceramic industries, which they are now marketing.

Jamestown Metalsmiths, Inc., Jamestown, N. Y., has been organized and has purchased the plant of the **Die Cast Art Bronze Corporation** to manufacture cast metal specialties of various sorts, featuring custom work of high grade. This firm operates the following departments: casting shop, plating, soldering, polishing, lacquering.

The **Arco Electrical Corporation,** Fort Wayne, Ind., has been organized by the officials of the Arco Battery and Plate Company, for the purpose of handling electrical and radio specialties and also batteries and battery parts.

BUSINESS TROUBLES

A portion of the assets of the **J. W. Paxson Company,** Philadelphia, Pa., has been disposed of and cash received. The Creditors' Committee in charge of liquidation has declared an initial dividend of 15 per cent.

Business Reports of the Metal Industry Correspondents

NEW ENGLAND STATES

WATERBURY, CONN.

OCTOBER 3, 1927.

John P. **Elton,** ex-mayor and former treasurer of the **American Brass Company,** has been nominated for mayor by the local Republican party. Mr. Elton is now president of the **Blake & Johnson Company**. His grandfather, John P. Elton, was one of the founders of the **Waterbury Brass Company,** one of the predecessors of the American Brass Company.

Most of the New York employes of the **U. T. Hungerford Brass & Copper Company** branch of the **Chase Companies,** Inc. of this city have been transferred here following the merger of that branch with the Chase Brass & Copper Company, distributing agency for the Chase companies. The plan is to concentrate the various distributing and warehouse branches. The local concern recently purchased the Hungerford Company. Prior to that time the distributing and the warehouse departments of the local concern ware operated as the Chase Brass & Copper Company, Inc. The purchase necessitated carrying the company's warehouses and distributing organizations under two names. Hereafter they will all be carried under the name of the Chase Brass & Copper Company and it is expected that the Hungerford Company's name will be used no longer.

Clifford H. Hall, secretary of the **Waterbury Clock Company** announces that the branch of the company, known as the **New England Watch Company**, will be closed. Most of the machinery and employes have already been transferred to the main plant of the Waterbury Clock Company. A wish to consolidate the activities of the company is the reason for the move. What will be done with the old plant is not yet determined, but it is expected that it will be sold. The old plant is the home of the Waterbury watch which was put out of the Waterbury Watch Company, organized in 1876 as an offshoot of the **Benedict & Burnham Company**, now part of the American Brass Company. The Waterbury Watch Company was later reorganized as the New England Watch Company, which later went into bankruptcy and was purchased by **R. H. Ingersoll & Brother**. All the assets of the latter company, including the local plant were purchased by the Waterbury Clock Company a few years ago.

The stockholders of the **Risdon Manufacturing Company** of this city and Naugatuck have sold the local branch of the company, formerly known as the **Novelty Manufacturing Company** to a group headed by **C. E. Beardsley**, president of the Risdon Company. The Naugatuck plant of the company was not involved in the sale and will continue to be operated by the Risdon Company. The price has not been mentioned but the new concern is to be capitalized at $500,000, the shares at $25 each being all subscribed. The name of the new concern will be the **Beardsley Manufacturing Company.** C. E. Beardsley will be president and the directors will be Mr. Beardsley; George T. Wigmore, now secretary and treasurer of the Risdon Company; Irving W. Day, vice president of the Connecticut Light & Power Company; William S. Fulton, president and treasurer of the Waterbury Farrel Foundry Company, and R. W. Phillips. The new company will immediately take over the Novelty Manufacturing Company's plant and continue the operations there which have heretofore been carried on by the Risdon Company.

Judge Edwin S. Thomas of the United States District court has decided in favor of the **Scovill Manufacturing Company** in its suit against **Joseph Satler** of Hartford, doing business under the name of the **Eagle Manufacturing Company**, asking for an injunction, an accounting and costs of the case. The local company claimed the Hartford concern was infringing on a patent for the manufacture of a straight lined frequency variable condenser used in radio sets. The Scovill Company's condenser is made under a patent granted to **Fritz Lowenstein.**

Irving H. Chase of this city, president of the **Waterbury Clock Company**, attended the hearing held by the Federal Trade commission in New York, Sept. 23, on the complaint against the local concern, the **Ingersoll Watch Company** of New York and the **George H. Eberhard Company** of San Francisco. The complaint charges that the local company and its distributors attempt to coerce jobbers handling "Ingersoll" watches into illegal price maintenance on the product. **Hermon P. Hayes**, general sales manager for the Ingersoll Watch Company denied at the hearing that company practices any such methods. It was claimed that midwestern jobbers, at the suggestion of the Ingersoll company, stopped sales of the watches to a Chicago retailer who was cutting prices.

F. S. Chase, president of the **Chase Companies, Incorporated**, attended the organization meeting of the **American Industry Committee** at the Waldorf-Astoria hotel in New York city last month. The committee, composed of leading manufacturers of the country, was appointed by the **American Manufacturers Association** to draft planks to be submitted to the political parties at their conventions next year. Four Connecticut manufacturers were picked for the committee, Mr. Chase being one.—W. R. B.

BRIDGEPORT, CONN

October 3, 1927

Resolutions on the death of **Frederick J. Kingsbury**, former chairman of the board of the **Bridgeport Brass Company**, who died in July, have been adopted by the local Chamber of Commerce, reading in part as follows:

"Mr. Kingsbury was a member of the executive committee of the Chamber of Commerce when it was first organized and served on it and as vice-president and director. In 1921 he was appointed national councillor of the local chamber to the United States Chamber. Throughout all this varied list of responsible activities he was of valuable, constant and unselfish service to the chamber. He was a trusted adviser, conservative but not too timid. He gave unstintedly of his sound judgment to his fellow officers and directors. He was unusually blessed in personal charm and in a genial courtesy which endeared him to his associates.

"Mr. Kingsbury was deeply interested in the welfare of Bridgeport, having faith in its future and pride in its present. He was a man of high ideals and civic righteousness. His example was an inspiration and his loss will be keenly felt."

Suit has been brought against the **Bassick Company** of this city by the United States government for $23,250. The amount is claimed is due for grenade bodies furnished by the government to the firm to complete contracts, the government claiming that these bodies were not returned with the completed grenade lots. **Henry O. King**, vice president and general manager of the Bassick Company, said that the suits have arisen out of war claims from 1917 on.

Willis F. Hobbs, president of the **Bridgeport Hardware Manufacturing Company**, attended the organization meeting of the Platform of American Industry committee in New York last month. The committee was appointed by the National Manufacturers Association to draft blanks on industry to be submitted to the national political conventions of both parties next year.—W. R. B.

CONNECTICUT NOTES

October 3, 1927

PLAINVILLE.—By order of the bankruptcy court, the **Colonial Brass Works** of this place, consisting of a two-story brick factory with six and one-half acres of land has been ordered sold. The company went into bankruptcy some time ago. The property is close to the center and adjoins the railroad. It is subject to one encumbrance, a first mortgage of $5,000.

BRISTOL.—B. O. Barnard of Bristol has purchased the plant of the defunct Bristol Manufacturing Company here for $55,000. He has arranged for the immediate tearing down of the old brick office building and the red frame building beside it. The brick factory building fronting on the street will be left in its present condition and probably resold as will the building adjoining the Plainville Coal & Lumber Company. The main building of the plant houses the supplies of the Trumbull Electric Company and will not be touched at present but probably will be wrecked within a year, Mr. Barnard said.

TORRINGTON.—The report of the **Torrington** Company and its subsidiaries, just made public, shows net profit for the year ending June 30 of $1,862,011, after all charges and federal taxes equivalent to $6.65 a share (par $25) earned on 280,000 shares of stock. This compares with $1,604,483 or $5.73 a share the preceding year. Total assets are given as $11,110,709, the surplus, $3,122,316 and the reserves for taxes as $274,020.—W. R. B.

MIDDLE ATLANTIC STATES

NEWARK, N. J.

October 3, 1927

Vice Chancellor Church has signed an order directing the **Newark Art Lamp Manufacturing Company**, of 54-60 McWhorter Street, to show cause why a receiver should not be appointed to conserve the assets. **William Greenbaum** was named custodial receiver. The papers filed show that the lamp company was organized on May 13, 1920, with a capitalization of $100,000, of which $5,000 has been paid in. Insolvency was charged.

The **National Lead Battery Company,** of St. Paul, Minn., with a subsidiary plant at North Bergen, N. J., has been awarded a government contract for the erection of airplane batteries. The North Bergen plant, recently completed, will be devoted entirely to the building of airplane and auto batteries. Special machinery will be installed at the plant. The specifications for the plates used in the airplane batteries stipulate 57-1000 on an inch in thickness whereas the ordinary battery plate is about one-eighth of an inch in thickness. As weight is an important factor in the construction of the battery this specification has been placed in the contract by the government aviation officials.

An outstanding feature of the battery, in which precaution in their construction calls for marked attention, is that they must be constructed in such a manner that the electrolyte will not spill out when the planes are flown on their side or upside down. This can be accomplished only through the use of a special patented tube in the vent cap. Officials say that the contract is but an entering wedge into a specialty, which cause a revolution in the battery industry.

Decision of the Belleville Board of Adjustment on granting the **National Harris Wire Company,** of New Haven, Conn., permission to build a wire drawing factory in the Belwood Park section of Belleville, N. J., has been withheld. The wire company said that if permission is granted it would erect a structure of good appearance, apply landscape gardening and manufacture in a manner which would create no nuisance in the community.

Vice Chancellor Church has appointed Lionel P. Kristeller temporary custodial receiver for the **Globe Art Manufacturing Company,** of Newark, N. J., manufacturers of phonograph and radio parts and brass novelties. Consent to the action was filed by the petitioner, Jacob Landsman, of Lakewood, president of the company and owner of more than one-third of the concern's stock. The order directed interested parties to show cause why the receivership should not be continued. It also gave Mr. Kristeller the right to continue the business at his own discretion.—C. A. L.

TRENTON, N. J.

October 3, 1927.

Metal conditions are not very encouraging at some of the Trenton plants, while others report that business is picking up a little. The **Jordan L. Mott Company** continues to operate five days a week and is not looking for any backward season. The **John A. Roebling's Company** is doing very well in its metal departments, while the **Skillman Hardware Manufacturing Company** reports business as fair.

The **Royal Airways, Inc.,** of Union City, N. J., has been incorporated at Trenton with $1,000,000 preferred and 10,000 shares common no par for the manufacture of aeroplanes. The incorporators are Edward Greenberg, Tillie Greenberg and Betty Coleman, Union City.

The following incorporations were chartered at Trenton during the past month: **Fire Stone Lighting Fixtures and Novelty Company,** electrical appliances, $25,000, Union City, N. J.; **New Jersey Valve and Casting Company,** castings, $125,000, Paterson, N. J.; **Eisler Engineering Oil Burner Division, Inc.,** oil burner, $?25,000, Newark, N. J.; **Ward Hardware and Electric Company, Inc.,** hardware, $100,000, Lakewood, N. J.; **Morristown Battery and Garage Company,** batteries, $125,000, Morristown, N. J.; **Walter S. Mills, Inc.,** manufacturing hardware, 1,000 shares no par, Paterson, N. J.; **Bailey Radium Laboratories, Inc.,** manufacture chemicals, $100,000, East Orange, N. J.—C. A. L.

MIDDLE WESTERN STATES

DETROIT, MICH.

October 3, 1927.

Work on the construction program, involving more than $1,000,000 at the plant of the **Mueller Brass Company** at Fort Huron, Mich., is now well underway, reports President O. B. Mueller. He also says the construction of a number of additional factory buildings will be continued through the winter months.

The **Seneca Electric Welding Corporation** has been incorporated in Detroit with a capital stock of $10,000. The stockholders are G. E. Evestone, R. M. McGuire and Harold W. Homes, 1650 Balmoral Drive, Detroit.

The **Dehco Baked Enamelling Company** has been incorpored at East Lansing, Mich., with a capital stock of $10,000.

The **Mueller Brass Company,** Fort Huron, has purchased two additional tracts of land as a part of its expansion program. Its holdings in the Lapeer avenue section of Port Huron now total 57.3 acres. O. B. Mueller, president, referring to the latest purchases, stated that the additional acreage was acquired to protect the company in preparation for future expansions.—F. J. H.

TOLEDO, OHIO

October 3, 1927.

General business in Toledo is making as good if not a better showing as any other manufacturing center in the Great Lakes district. This is particularly true in reference to those concerns engaged in the brass, copper and plating industry. These plants have been in fair operation throughout the summer and prospects are favorable for the fall and winter. There are, however, a considerable number of persons out of work. Steady jobs are scarce in every line. Local residents are given preference to those coming in from outside.

Toledo will have a new industry as the result of the formation of the **Thompson-Owens Corporation,** by a group of local residents, to manufacture bronze bushings and bearings for the automotive and machine tool trade. The company capitalized for $50,000, will take over the plant and some of the foundry equipment of the former **East Toledo Aluminum & Brass Castings Company,** 2602 York street. **George Thompson,** manager of the **Bunting Brass & Bronze Company** for ten years, is president of the new company and **John E. Owens,** who was connected 14 years with the sales department of the same company, is secretary and treasurer **Clyde D. Eno** is vice president. These three men, with **Frank C. Fisher,** are the incorporators. Production is expected to be well underway soon.—F. J. H.

MILWAUKEE, WIS.

October 3, 1927.

The metal industry throughout Wisconsin and southern Illinois is enjoying a good period of prosperity at the present time. Inquiries at the various plants indicate that orders are not very slow in coming in, and a considerable number of orders are booked for future delivery. The heads of a few of the brass goods manufacturing plants in this territory are very optimistic about the future trend in the industry and look for good business throughout the winter.

One thing that the correspondent noticed this year was the fact that many southern Illinois plants as well as Wisconsin plants took time to enter exhibits of their products at many of the state fairs which were held the last week in August and all through September. This is an excellent way of securing publicity for metal products that will be remembered, for people attending fairs and the like always take trouble to inspect all products on display.

At the Wisconsin State Fair, which was held in Milwaukee, August 29 to Sept. 4, one of the largest events of its kind in the country many metal firms entered exhibits. The **Specialty Brass Company,** Kenosha has a very attractive display of creamery fittings and various attachments for daily equipment. These were all of brass and attracted much attention. The **American Brass Company** also of Kenosha, also had a fine exhibit.

Manitowoc, Wis., was represented by the **Aluminum Goods Manufacturing Company.** West Bend, Wis., was represented by the display of the **West Bend Aluminum Company**. Other

cities entering displays of metal firms were, **Western Metal Specialty Company,** Milwaukee; the **Vollrath Company,** Sheboygan; **Rundle Manufacturing Company,** Milwaukee; **Racine Sheet Metal Works,** Racine; **Metal Ware Corporation,** Two Rivers; **Kohler Company,** Kohler; **Hamilton Manufacturing Company,** Two Rivers; **Geuder, Paeschke & Frey Company,** Milwaukee.

The city of Beloit, Wis., recently staged a large annual Fall Festival and Trade Exposition. A number of metal firms entered exhibits in the event. They were: **Beloit Brass Works, Acme Pattern Works** and the **Interstate** Pattern **Works.**

Fire last month destroyed the warehouse of the **Racine Metal Company,** Racine, Wis. This is the second fire the firm has suffered within three months, according to **Louis Silverman,** proprietor.

The **Milwaukee Gas Cock Manufacturing Company,** has been organized to manufacture gas cocks, service cocks and brass goods. Incorporators are Max Fielder, George E. Ballhorn and Irma Summers.—A. P. N.

OTHER COUNTRIES

BIRMINGHAM, ENGLAND

SEPTEMBER 19, 1927.

Owing to the rise in metals the metal rollers of Birmingham have advanced prices of strong copper sheets by £2 per ton and brass wire ¼d per pound. Some firms are well furnished, with orders sufficient to occupy the mills for six months at least. A larger proportion than for many months past of the tube orders is for shipbuilding requirements. There are better orders from India for sheets.

The demand for copper tubes for the supply of domestic water is making rapid progress. An increasing proportion of the thousands of new houses in course of erection in all parts of the country will be equipped with copper water tube. Scotland and the provinces show a decided preference for copper as compared with lead and an expanding business is done with the Colonies, but London still lags behind in comparison with other centers.

Next to this development the most noticeable change is in the very large demand for white metal largely called for in shipbuilding and domestic fittings. The cost is slightly higher than for brass, but as a rule it is found that the extra expenditure is justified. The buyers, however, are more insistent in getting "white" metal, a common complaint being that the articles so described are very often anything but white and are more nearly yellow. There is a big demand for industrial fittings in this class of alloy, but large firms in their catalogues lately issued make no change in their prices and have decided to postpone the pricing of their goods until the issue of the next catalogue.

Some signs of recovery are apparent in the jewelry trade. There is a prospect of a busy autumn. The seaside season has been on the whole disappointing mainly through the bad weather.

In the silver and plating trades competition is keen for better class gift goods. There is now very little demand for large dinner sets, although there is a good sale for breakfast cruet stands, etc. It is believed that the business has been affected by the increasing popularity of cut glass ware, especially of an ornamental character.

Hadfields, Ltd., have acquired control of **Bean Cars, Ltd.,** and are laying down plans for electro-plating some of the steel parts made at their Sheffield works.

The makers of plumbers brasswork are very busy especially those fitting up shop fronts, the demands of the London trade having latterly been very large.

Some good lines in railway lamps have been placed lately and the lamp makers generally are very busy.

In the galvanized hollowware trade business is very well maintained with the Dominions, but local competition is keen. In the electrical trades very big contracts have been placed and the manufacturers consider that there is still a big leeway to be made up and activity is looked forward to for several months.—J. H.

Business Items—Verified

The **Aluminum Goods Manufacturing Company,** Two Rivers, Wis., announces that their building program has been indefinitely postponed.

The **Barnes Foundry Company,** 4007 Detroit Avenue, Cleveland, Ohio, is erecting a one-story addition, 50 x 60 ft. This firm operates a brass, bronze and aluminum foundry.

The **Price-Pfister Brass Manufacturing Company,** 2922 Humboldt Street, Los Angeles, Cald will build a one-story machine shop. This fire operates a brass foundry and machine shop.

The **Hauck Brothers Company** of Centerville, Cal., announces the merger of its plant and organization with the Ferro Enameling Company of California. H. B. Naylor is manager of the latter plant.

The **Geo. D. Roper Corporation,** of Rockford, Ill., recently built a new porcelain enameling department. Four large sized porcelain enameling furnaces were installed by the Ferro Enamel Supply Company, Cleveland, O.

Hamilton Casting and Manufacturing Company, Hamilton, Ohio, is erecting a one-story, 54 x 216 ft. addition to its factory. This company operates the following departments: tool room, casting shop, stamping, grinding room.

The **Wade Engineering Company** of Los Angeles, California, which handles products of the Lincoln Electric Company, Cleveland, Ohio, announces that their northern office has been moved from 69 Webster Street, Oakland, to 533-539 Market Street, San Francisco.

The **Aluminum Company of Canada, Ltd.,** 158 Sterling Road, Toronto, Canada, is building a $25,000 addition to its plant. This firm operates the following departments: aluminum foundry, tool room, rolling mill, spinning, stamping, polishing, grinding room.

The **General Lead Batteries Company,** 4 Lister Avenue, Newark, N. J., manufacturer of storage batteries, etc., has awarded a contract for a one-story addition at 99-129 Chapel Street, to cost about $45,000. E. A. Margueson is vice-president. This firm operates a casting shop.

The **Brown Instrument Company,** Philadelphia, Pa., has established a new branch office at Kansas City, Mo., territory covered by this office includes the states of Kansas, Nebraska, the western part of Missouri and the city of Council Bluffs, Iowa. F. M. Poole will be district manager in charge. The address of the new office is 509 Mutual Building.

M. Grossman, representative in the New England territory for the Reading Foundry and Supply Company, Reading, Pa., manufacturer of plumbing, heating and tinners' supplies and sanitary fixtures, has removed his headquarters from 1090 Eastern Parkway, Brooklyn, to 124 Selden Street, Dorchester, Mass. This firm operates the following departments: brass and bronze foundry; stamping.

American Brass and Iron Company, Detroit, Mich., is building a new foundry and machine shop at 6500 Georgia Avenue, to provide for enlarged facilities. The foundry will be 55 x 85 ft. brick and steel construction. The machine shop, office and shipping building is 80 x 100 ft. of reinforced concrete construction. This firm makes a specialty of cast brass work, machined to sample or blue print.

Booth Coulter Copper and Brass Company, Toronto, Ont., Canada, is having plans prepared for an addition to its polishing and plating department to handle increased business. The shipping and receiving departments will also have much better facilities. This firm operates the following departments: brass, bronze and aluminum foundry; brass machine shop, tool room, spinning, brazing, plating, stamping, soldering, polishing, lacquering, coppersmithing.

The Air Reduction Company, Inc., 342 Madison Avenue,

New York, has purchased the oxygen plant, equipment and entire business of the **New England Compressed Gas Company,** Boston, Mass. With this new purchase the Air Reduction Company, Inc., and the Air Reduction Sales Company command the production and distribution facilities of thirty-five oxygen plants all located in or near the chief industrial centers of the United States.

The **American Castings Company,** 6833 South Irving Avenue, Chicago, Ill., has under construction, to be completed and in operation in about two weeks, a new addition to its present plant, consisting of a brick building, 72x125 ft., one story. The equipment will consist of latest types of furnaces, traveling cranes, molding machines, blowers, compressors, sand blast, core ovens, etc. This is now one of the largest aluminum foundries in Chicago handling jobbing work exclusively. With the additional plant in operation, the normal capacity will be increased from 12,000 to 30,000 pounds of aluminum castings daily.

Review of the Wrought Metal Business

Written for The Metal Industry by J. J. WHITEHEAD, President, of the Whitehead Metal Products Company of New York, Inc.

OCTOBER 3, 1927

Very little change was noted in the market for brass and copper, sheets, rods, tubes and wire, during September. Expectations of a buying movement to be started during September apparently have ended in some degree of disappointment. The hand-to-mouth policy of buying is still the rule. There are some people in the industry who feel that this policy of buying is so firmly fixed in the trade that it has become a habit which will be hard to break, and that the days of the heavy buying movements have passed. Mill capacity is large and sufficiently flexible to meet the requirements of the trade for reasonably prompt deliveries of special material, and the distributing factors holding stocks of standard sizes and shapes in important centers thruout the country have developed a high degree of efficiency for service. The demands of the trade are so well satisfied that there is no need for the consumers to burden themselves with any inventory beyond the necessary quantities to fill contracts actually in hand.

In a rising market there is of course a definite incentive to place orders or blanket contracts for near future delivery, but in a weak or wavering copper market this incentive is entirely lacking. It is not surprising, therefore, that the September activities were somewhat disappointing to those who felt that the Fall demand would be reflected on the order books of the producers.

There has been a doubtful feeling as to copper prices and a consequent hesitancy to do any very heavy buying. The mills have continued to run on an average of about five days a week, and complaints of slow business in some departments have been slightly more numerous. Prices have been shaded a trifle here and there in an effort to secure some added tonnage, but on the whole the conditions in this respect are fairly good.

Business in nickel and the copper nickel alloys, such as Monel metal and nickel silver is in a somewhat better condition than is the case with the other non-ferrous metals. The various manufacturers of equipment for hotels, restaurants, dairies, hospitals, and allied lines have had a good run of business for several months, and the Fall business from this trade has opened up in an encouraging manner. Many new orders have been placed for large equipment contracts, including the Pennsylvania State Hospital, Mt. Sinai Hospital, Allentown Hotel, and a number of other institutions in New England, New York and the middle west.

The textile industry has begun to show signs of activity with the placing of a number of large contracts for Monel metal dyeing equipment.

It is interesting to note that during September a number of large equipment contracts for textile and chemical plants have been placed, and that in many cases the quotations on these contracts were figured in the early part of the year, and estimates submitted at that time. It is felt that the closing of these contracts now, after several months of consideration, showing a willingness to go ahead this Fall with many projects that were held up during the summer, indicates a feeling of confidence in the outlook for good business.

Metal Market Review

Written for The Metal Industry by R. J. HOUSTON of D. Houston & Company, Metal Brokers, New York

COPPER

OCTOBER 3, 1927

September sales of copper were in large volume, with demand for foreign shipment especially good. Domestic buying was on a substantial scale, although not fully up to expectations. Price movements were kept within a narrow range, due chiefly to the array of favorable features and the firmness of producers. The dominant interests booked important business at 13¼ cents delivered to Connecticut Valley points and at 13½ cents c. i. f. European ports. Moderate sales were also reported at 13⅛ cents for domestic account, but shading of regular market prices was exceptional.

Production is moving steadily into consuming channels both here and abroad. The facility with which consumption continues to absorb enormous quantities of copper is an outstanding feature of the situation. Copper statistics for August showed total deliveries during that month of 261,040,000 pounds of refined copper, or 21,468,000 pounds more than the refinery output for that month. The total surplus stocks in refined form held by first hands on September 1 were 187,308,000 pounds, being a reduction of 21,468,000 pounds since August 1st. Market holds firm at 13¼ cents Connecticut delivery, and 13½ cents c. i. f. European destination. There is sound ground for the opinion that this is no time to be bearish on copper.

ZINC

The undertone of the zinc market has been easier lately, and the majority of buyers were conservative in placing new orders. The ore situation has been less firm, but if curtailment of output is resorted to it might steady the market and revive buying on a more substantial scale. Recent offerings of ore were in excess of sales, and if this condition continues its influence on prices it will not be helpful. American statistics have improved, but the market has not benefited from this feature as yet. Zinc stocks in smelters' hands decreased 4,736 tons in August. Total domestic shipments and exports during that month amounted to 53,748 tons, and were the largest this year. The August output was 49,012 tons as against 47,627 tons in July and 49,718 tons in June. The price of zinc at present is 6.17½c to 6.20c per pound East St. Louis.

TIN

Conditions in tin were unusually unsettled recently. Market weakness characterized movements in both the New York and London markets, with adverse features an outstanding influence much of the time during the month. Heavy liquidation and speculative operations gave impetus to declining prices. Consumers purchased cautiously even on the frequent breaks. Traders were active participants in the market, however, and speculative transactions were in large volume. Prominent operators at the London center switched their position from the buying to the selling side, thus increasing the bearish tendency of the market. New low levels were established in over a year. The price of Straits tin fell below 60 cents during the last half of September, and in a single week the London market declined £14 17s. 6d. per ton, with a drop of 3¾ cents in price of September Straits tin.

There are indications that domestic consumption is receding somewhat. As this report closes the market for Straits tin quotes 59¼c to 59½c for October delivery.

LEAD

The lead market has felt the tension incident to aggressive buying and a weaker foreign tendency. A receding tin market also had a discouraging effect, and the scale of buying was too restricted to create buoyant conditions. Producers, however, maintained a New York price of 6¼ cents, and were not inclined to press sales. Consumption is in good volume, and present market values are such as to merit the close attention of the trade. There may be further concessions, but the market has reached a stage where the turning point may start any day.

ALUMINUM

The general situation in aluminum shows no indications of special change. The volume of recent new business was in fair volume, but with many buyers inclined to cover requirements on a hand-to-mouth basis. Consuming industries are operating on a fair scale of activity, and the outlook for a large demand during the balance of the year is good. Prices are maintained at 26c for commercial ingot 99% plus and at 25c for the metallurgical grade of 94-99%. There have been no market changes in prices for months, and no pronounced deviation from present values is in prospect. European reports indicate a continuation of heavy consumption in Germany, with increased imports into that country. Recent imports of aluminum into this country were heavy, but the general situation remains remarkably steady.

ANTIMONY

The trend of the market for antimony during September was downward. Demand was unusually quiet recently, and Chinese regulus declined to 10½c duty paid for spot delivery in carload lots. Buyers were difficult to interest, and the slack demand has had a depressing effect upon the market as seen in receding prices. The Chinese output is said to be too large for the present outlet, considering the substantial supplies carried both here and in China. Imports of antimony into the United States for the first seven months of this year amounted to 17,428,601 pounds compared with 18,136,527 pounds during the corresponding months in 1926. Consumption appears to be fairly good, and a better demand is likely to develop in the next few weeks.

QUICKSILVER

The demand for quicksilver is reported more active, and the market holds steady at $120 to $121 per flask. Buyers have displayed considerable interest lately.

PLATINUM

Refined platinum quotes $65 to $66 per ounce. Demand has been rather light, with ample supplies for all requirements.

SILVER

Conditions in this market lately revealed more activity and higher prices. There was a good demand from China and India in September. A good volume of buying was done for Far East account which sent prices up to 56⅛ cents. Chinese operators were quite active on the buying side for a time, but later reversed their position, thereby placing a check on the upward trend. With a falling off in foreign orders the bullion market is easier at this writing, being quoted at 55⅝ cents New York. It is generally conceded that the price of silver is down to a low level, and any specially favorable developments would place the market on a more satisfactory basis.

OLD METALS

Demand for both copper and brass material was in fair volume, and reflected a slight forming up in the virgin metal. Important buying movements, however, were at intervals, but the firmer views of sellers was taken to indicate improvement in actual trading provided the markets for new metals develop a stronger tendency. Domestic demand showed signs of improvement in a general way, and export inquiries are apparently inclined to broaden out. Foreign buyers are demanding more careful selection and packing for material purchased here. Attention to these matters will bring favorable results and satisfactory shipping conditions for a group of commodities Europe wants. New York prices are quoted at 10½ cents to 10¾ cents for heavy copper, with recent bids of 11 cents. Light copper, 9¼ cents to 9½ cents; heavy brass, 6¾ cents to 7 cents; heavy lead, 5¼ cents to 5⅜ cents; old zinc, 3¾ cents to 4 cents, and aluminum clippings, 18½ cents to 19 cents.

Daily Metal Prices for the Month of September, 1927

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	1	2	*5	6	7	8	9	12	13	14	15	16	19
Copper c/lb. Duty Free													
Lake (Delivered)	13.375	13.375	.....	13.375	13.375	13.25	13.25	13.25	13.25	13.25	13.375	13.375	13.375
Electrolytic (f. a. s. N. Y.)	13.25	13.25	.....	13.25	13.25	13.25	13.25	13.25	13.25	13.25	13.35	13.35	13.35
Casting (f. o. b. N. Y.)	12.75	12.75	.....	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.90	12.90	12.90
Zinc (f. o. b. St. L.) c/lb. Duty 1¼ c/lb.													
Prime Western	6.275	6.25	.....	6.30	6.30	6.25	6.25	6.275	6.275	6.30	6.275	6.275	6.25
Brass Special	6.35	6.35	.....	6.375	6.375	6.325	6.325	6.325	6.325	6.35	6.35	6.35	6.30
Tin (f. o. b. N. Y.) c/lb. Duty Free													
Straits	63.625	63.50	.....	63.75	63.75	63.625	63.375	62.50	61.875	62.25	62.25	62.125	61.625
Pig 99%	62.625	62.625	.....	62.875	62.875	62.625	62.50	62.00	61.25	61.75	61.75	61.625	61.25
Lead (f. o. b. St. L.) c/lb. Duty 2¼ c/lb.	6.125	6.15	.....	6.15	6.10	6.10	6.00	6.00	6.00	6.075	6.10	6.10	6.10
Aluminum c/lb. Duty 5c/lb.	26	26	.....	26	26	26	26	26	26	26	26	26	26
Nickel c/lb. Duty 3c/lb.													
Ingot	35	35	.....	35	35	35	35	35	35	35	35	35	35
Shot	36	36	.....	36	36	36	36	36	36	36	36	36	36
Electrolytic	39	39	.....	39	39	39	39	39	39	39	39	39	39
Antimony (J & Ch) c/lb. Duty 2c/lb.	11.75	11.75	.....	11.75	11.625	11.50	11.375	11.375	11.375	11.25	11.125	11.125	11.00
Silver c/oz. Troy Duty Free	54.375	54.625	.....	54.875	55	55.25	55.375	55.50	55.50	55.25	55.375	55.50	56.125
Platinum $/oz. Troy Duty Free	66	66	.....	66	66	66	66	66	66	66	66	66	66

*Holiday.	20	21	22	23	26	27	28	29	30	High	Low	Aver.
Copper c/lb. Duty Free												
Lake (Delivered)	13.375	13.375	13.25	13.25	13.25	13.25	13.25	13.25	13.25	13.375	13.25	13.304
Electrolytic (f. a. s. N. Y.)	13.30	13.25	13.20	13.20	13.20	13.15	13.15	13.15	13.10	13.35	13.10	13.238
Casting (f. o. b. N. Y.)	12.90	12.90	12.75	12.75	12.75	12.75	12.625	12.625	12.625	12.90	12.625	12.768
Zinc (f. o. b. St. L.) c/lb. Duty 1¼ c/lb.												
Prime Western	6.25	6.20	6.20	6.20	6.15	6.15	6.15	6.10	6.05	6.30	6.05	6.225
Brass Special	6.30	6.25	6.25	6.25	6.20	6.20	6.20	6.15	6.10	6.375	6.10	6.286
Tin (f. o. b. N. Y.) c/lb. Duty Free												
Straits	61.625	60.75	60.625	60.00	59.625	58.875	58.75	59	57.875	63.75	57.875	61.494
Pig 99%	61.00	60.375	59.625	58.875	58.375	57.875	57.625	58	57.125	62.875	57.125	60.696
Lead (f. o. b. St. L.) c/lb. Duty 2¼ c/lb.	6.10	6.075	6.075	6.05	6.05	6.05	6.00	6.00	6.00	6.15	6.00	6.067
Aluminum c/lb. Duty 5c/ lb.	26	26	26	26	26	26	26	26	26	26	26	26
Nickel c/lb. Duty 3c/lb.												
Ingot	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	39	39	39	39	39	39	39	39	39	39	39	39
Antimony (J & Ch) c/lb. Duty 2c/lb.	10.875	10.75	10.625	10.50	10.375	10.375	10.375	10.375	10.75	11.75	10.375	11.048
Silver c/oz. Troy Duty Free	55.625	55.875	55.625	56	55.625	55.625	55.625	55.875	55.75	56.125	54.375	55.446
Platinum $/oz. Troy Duty Free	66	66	66	66	66	66	66	66	66	66	66	66

Metal Prices, October 3, 1927

NEW METALS

Copper: Lake, 13.25. Electrolytic, 13.15. Casting, 12.75.
Zinc: Prime Western, 6.00. Brass Special, 6.05.
Tin: Straits, 59.25. Pig, 99%, 58.12.
Lead: 6.00. Aluminum, 26.00. Antimony, 10.875.
Nickel: Ingot, 35. Shot, 36. Elec., 39. Pellets, 40.
Quicksilver: flask, 75 lbs. $122.50. Bismuth, $1.85 to $2.00.
Cadmium, 75. Cobalt, 97%, $2.60. Silver, oz., Troy, 55.50.
Gold: oz., Troy, $20.67. **Platinum,** oz., Troy, $66.00.

INGOT METALS AND ALLOYS

Brass Ingots, Yellow	9¾ to 10¾
Brass Ingots, Red	12 to 13
Bronze Ingots	12½ to 16
Casting Aluminum Alloys	21 to 24
Manganese Bronze Castings	23 to 40
Manganese Bronze Ingots	12 to 16
Manganese Bronze Forging	32 to 40
Manganese Copper, 30%	25 to 35
Monel Metal Shot	28
Monel Metal Blocks	32
Parsons Manganese Bronze Ingots	18¼ to 19¾
Phosphor Bronze	13½ to 15
Phosphor Copper, guaranteed 15%	17½ to 21
Phosphor Copper, guaranteed, 10%	16 to 20
Phosphor Tin, guaranteed 5%	75 to 80
Phosphor Tin, no guarantee	66 to 75
Silicon Copper, 10%.....according to quantity.....	28 to 32

OLD METALS

Buying Prices		Selling Prices
11¼ to 11¾	Heavy Cut Copper	12¾ to 13¼
10¾ to 11¼	Copper Wire	12¼ to 12½
9¼ to 9¾	Light Copper	10¾ to 11
9 to 9½	Heavy Machine Composition	10 to 10¼
7½ to 7¾	Heavy Brass	8¼ to 9
6¼ to 6½	Light Brass	7½ to 7¾
7¼ to 7½	No. 1 Yellow Brass Turnings	8¾ to 9¼
8¼ to 8¾	No. 1 Composition Turnings	9¾ to 10¼
6¼ to 6½	Heavy Lead	7¼ to 7½
4¼ to 4½	Zinc Scrap	5¼ to 5¾
10 to 11	Scrap Aluminum Turnings	13 to 15
14½ to 15	Scrap Aluminum, cast alloyed	18 to 19
20 to 20½	Scrap Aluminum, sheet (new)	22½ to 23
38 to 40	No. 1 Pewter	42 to 44
12	Old Nickel Anodes	14
18	Old Nickel	20

Wrought Metals and Alloys

COPPER SHEET

Mill shipments (hot rolled)	21c. to 22c. net base
From stock	22c. to 23c. net base

BARE COPPER WIRE

15¼c. to 15½c. net base, in carload lots.

COPPER SEAMLESS TUBING

24c. to 25c. net base.

SOLDERING COPPERS

300 lbs. and over in one order ..... 20½c. net base
100 lbs. to 200 lbs. in one order ..... 21c. net base

ZINC SHEET

Duty sheet, 15% — Cents per lb.
Carload lots, standard sizes and gauges, at mill, less 8 per cent discount ..... 10.00 net base
Casks, jobbers' price ..... 10.50 net base
Open Casks, jobbers' price ..... 10.75 to 11.25 net base

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga., base price	39 c.
Aluminum coils, 24 ga., base price	33½c.
Foreign	40 c.

ROLLED NICKEL SHEET AND ROD

Net Base Prices

Cold Drawn Rods	53c.	Cold Rolled Sheet	60c.
Hot Rolled Rods	45c.	Full Finish Sheet	52c.

BLOCK TIN SHEET

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more 10½c. over Pig Tin; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 17c. over; less than 25 lbs., 25c. over.

SILVER SHEET

Rolled sterling silver 56¾c. to 58¾c. per ounce, Troy.

BRASS MATERIAL—MILL SHIPMENTS

In effect August 2, 1927
To customers who buy 5,000 lbs. or more in one order.

	Net base per lb. High Brass	Low Brass	Bronze
Sheet	$0.18¼	$0.19¾	$0.21¾
Wire	.18¾	.20¼	.22¼
Rod	.16	.20½	.22½
Brazed tubing	.26¼	....	.31½
Open seam tubing	.26¼	....	.31½
Angles and channels	.29¼	....	.34½

For less than 5,000 lbs. add 1c. per lb. to above prices.

BRASS SEAMLESS TUBING

23⅛c. to 24⅛c. net base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	20¼c. net base
Muntz or Yellow Metal Sheathing (14"x48")	18¼c. net base
Muntz or Yellow Rectangular sheet other Sheathing	19¼c. net base
Muntz or Yellow Metal Rod	16¼c. net base

Above are for 100 lbs. or more in one order.

NICKEL SILVER (NICKELENE)

Net Base Prices

Grade "A" Sheet Metal		Wire and Rod	
10% Quality	26 c.	10% Quality	29 c.
15% "	27½c.	15% "	32¾c.
18% "	28¾c.	18% "	36 c.

MONEL METAL SHEET AND ROD

Hot Rolled Rods (base) 35	Full Finished Sheets (base) 42
Cold Drawn Rods (base) 43	Cold Rolled Sheets (base) 50

BRITANNIA METAL SHEET

No. 1 Britannia—18" wide or less, No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. to 500 lbs., 10c. over; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 20c. over; less than 25 lbs., 25c. over. Prices f. o. b. mill.

Supply Prices, October 3, 1927

ANODES

Copper:	Cast	20¼c. per lb.
	Rolled	19⅛c. per lb.
	Electrolytic	20c. per lb.
Brass:	Cast	19¼c. per lb.
	Rolled	19⅛c. per lb.
Zinc:	Cast	13c. per lb.
Nickel:	90-92%	45c. per lb.
	95-97%	47c. per lb.
	99%	49c. per lb.

Silver: Rolled silver anodes .999 fine are quoted from 58⅝c. to 60⅝c. Troy ounce, depending upon quantity purchase.

FELT POLISHING WHEELS WHITE SPANISH

Diameter	Thickness	Under 100 lbs.	100 to 200 lbs.	Over 200 lbs.
10-12-14 & 16"	1" to 3"	$3.00/lb.	$2.75/lb.	$2.65/lb.
6-8 & over 16	1 to 3	3.10	2.85	2.75
6 to 24	Under ½	4.25	4.00	3.90
6 to 24	½ to 1	4.00	3.75	3.65
6 to 24	Over 3	3.40	3.15	3.05
4 up to 6	¼ to 3	4.85	4.85	4.85
4 up to 6	Over 3	5.25	5.25	5.25
Under 4	¼ to 3	5.45	5.45	5.45
Under 4	Over 3	5.85	5.85	5.85

Grey Mexican Wheel deduct **10c per lb.** from White Spanish prices.

COTTON BUFFS

Full Disc Open buffs, per 100 sections.

12" 20 ply 64/68 Unbleached	$32.40-35.75
14" 20 ply 64/68 Unbleached	40.30-46.00
12" 20 ply 80/92 Unbleached	36.00
14" 20 ply 80/92 Unbleached	48.00
12" 20 ply 84/92 Unbleached	40.70-43.65
14" 20 ply 84/92 Unbleached	55.20-59.20
12" 20 ply 80/84 Unbleached	39.40-39.55
14" 20 ply 80/84 Unbleached	53.05-53.60

Sewed Pieced Buffs, per lb., bleached 55-70c.

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.11-.16
Acid—Boric (Boracic) Crystals	lb.	.12
Chromic	lb.	.28
Hydrochloric (Muriatic) Tech., 20°, Carboys	lb.	.02
Hydrochloric, C. P., 20 deg., carboys	lb.	.06
Hydrofluoric, 30%, bbls	lb.	.08
Nitric, 36 deg., carboys	lb.	.06
Nitric, 42 deg., carboys	lb.	.07
Sulphuric, 66 deg., carboys	lb.	.02
Alcohol—Butyl	lb.	.19-23½
Denatured, bbls.	gal.	.59
Alum—Lump, Barrels	lb.	.03¼
Powdered, Barrels	lb.	.042
Aluminum sulphate, commercial tech	lb.	.02⅜
Aluminum chloride solution in carboys	lb.	.06½
Ammonium—Sulphate, tech. bbls	lb.	.03¾
Sulphocyanide	lb.	.65
Arsenic, white, kegs	lb.	.05
Asphaltum	lb.	.35
Benzol, pure	gal.	.60
Borax Crystals (Sodium Biborate), bbls	lb.	.04½
Calcium Carbonate (Precipitated Chalk)	lb.	.04
Carbon Bisulphide, Drums	lb.	.06
Chrome Green, bbls	lb.	.28
Chromic Sulphate	lb.	.37
Copper—Acetate (Verdegris)	lb.	.37
Carbonate, bbls.	lb.	.16
Cyanide (100 lb. kegs)	lb.	.50
Sulphate, bbls.	lb.	.05¾
Cream of Tartar Crystals (Potassium bitartrate)	lb.	.27
Crocus	lb.	.15
Dextrin	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Flour-spar (Calcic flouride)	ton	$75.00
Fusel Oil	gal.	$4.45
Gold Chloride	oz.	$14.00
Gum—Sandarac	lb.	.26
Shellac	lb.	.59-.61
Iron, Sulphate (Copperas), bbl	lb.	.01½
Lead Acetate (Sugar of Lead)	lb.	.13¾
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Nickel—Carbonate dry, bbls	lb.	.29
Chloride, bbls.	lb.	.17-.18
Salts, single 300 lb. bbls	lb.	.10½
Salts, double 425 lb. bbls	lb.	.10
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity		.35-.40
Potash, Caustic Electrolytic 88-92% broken, drums	lb.	.09¾
Potassium Bichromate, casks (crystals)	lb.	.08½
Carbonate, 96-98%	lb.	.07½
Cyanide, 165 lb. cases, 94-96%	lb.	.57½
Pumice, ground, bbls.	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Rouge, nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.06
Silver Chloride, dry	oz.	.86
Cyanide (fluctuating)	oz.	.60
Nitrate, 100 ounce lots	oz.	.40½
Soda Ash, 58%, bbls	lb.	.02½
Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.20
Hyposulphite, kegs	lb.	.04
Nitrate, tech., bbls.	lb.	.04¾
Phosphate, tech., bbls	lb.	.03¾
Silicate (Water Glass), bbls	lb.	.02
Sulpho Cyanide	lb.	.45
Sulphur (Brimstone), bbls	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.44½
Tripoli, Powdered	lb.	.03
Wax—Bees, white ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
Whiting, Bolted	lb.	02½-.06
Zinc, Carbonate, bbls	lb.	.11-.12
Chloride, casks	lb.	.06¾
Cyanide (100 lb. kegs)	lb.	.41
Sulphate, bbls.	lb.	.03½